The

Electrical Review

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The Result of our Competition.

WE have pleasure in announcing below the names of the winners of prizes in the ELECTRICAL REVIEW Advertisement Competition:—

CLASS A.

FIRST PRIZE, £100 Awarded to Mr. J. L. Hayden (Sells, Ltd.), 168, Fleet Street, London, E.C.4, for the six full-page advertisements of the Macintosh Cable Co., Ltd., Ashbourne Road Mills, Derby.

Two SPECIAL PRIZES of £50 each—

(1) Awarded to the Wandsworth Electrical Manufacturing Co., Ltd., Imperial Works, Ludgate Hill, Birmingham, for six full-page advertisements prepared by Mr. John F. Preston (Messrs. H. P. Pope, Ltd., Advertising Agents).

(2) Awarded to Messrs. A Reyrolle & Co, Ltd., of Hebburn-on-Tyne, for six full-page advertisements.

(These two Special Prizes are additional to those originally offered. The keenness of competitors in the full-page class was so great, and the work so good, that after considering the report of the Judges, the Directors decided to award these extra prizes to the entrants named who ran neck and neck for second place right to the finish.)

CLASS B.

PRIZE, £50—Awarded to Messrs. Evershed and Vignoles, Ltd., Acton Lane Works, London, W. (Advertising Manager, Mr. A. W. Swan), for the best six half-page advertisements.

CLASS C.

PRIZE, £25 Awarded to Mr. J. E. Crawshaw, 28, Deansgate, Manchester, for the best six quarter-pages of the Lea Recorder Co., Ltd.

The number of advertisers who entered for the com-

petition was 45. The judging took place on Thursday, February 4th, at the Hotel Cecil. Messrs. J. W. Beauchamp and L. L. Robinson commenced their very difficult task at 11 a.m., and late in the afternoon on the same day the Electrical Review notified the five winners of their successes by telegram.

All of the submitted advertisements were carefully mounted on stout white cards, and arranged on tables around and in the centre of the well-lighted Pompadour Room.

We reproduce the successful advertisements in a special Art Supplement this week.

The Judges were entirely of one mind in the decisions reached, and the Directors of the Electrical Review, Ltd., desire to acknowledge the debt of deep gratitude to them for so efficiently performing their very difficult duty.

The prizes were duly posted on Friday, February 5th.

We print below the full report of the Judges, and some comments by them appear on page 244 :—

"Electrical Review" Competition.

To the Directors of the Electrical Review, Ltd.

In preparing a report upon our examination of the competing advertisements in the Electrical Review Competition, we hope that it will be recognised that we have experienced considerable difficulty in comparing advertisements of goods of very varying appeal or attractiveness; for example, note the different treatment required for plant, instruments, and accessories respectively. The existence of this difficulty has not, however, prevented us from arriving at quite definite conclusions as to the best series submitted in each of the three Classes.

The entries of the Macintosh Cable Co., Ltd., are recommended for the first prize in the full-page series (Class A). In all the four essential points: power of immediate attraction; qualities compelling continued attention; boldness of design; and artistic arrangement —these advertisements are excellent. They are conspicuous for the way in which they have produced a well-told story on a difficult subject.

The full-page series entered by Messrs. A. Reyrolle and Co. and the Wandsworth Electrical Manufacturing Co., Ltd., respectively, admirably execute the same difficult task, and we select them as being of equal merit and deserving of special recognition. Other competitors produced excellent examples of the purely technical advertisement in attractive form; one was noteworthy for its determination to attain to "truth in advertising" by modestly claiming to be only "very nearly perfect"; others made good use of the readiness with which plant lends itself to effective display.

In Class B (half-pages) we recommend as the best series those submitted by Messrs. Evershed & Vignoles, Ltd. In respect of design these advertisements compel attention. They make good use of the house outline around the Megger; also of the chart behind the recorder; and of the worry of a man who kept no records. They also get home well with the argument about the security which is assured by the use of reliable instruments.

Turning now to Class C (quarter-page), we recommend the series of the Lea Recorder Co., Ltd. for the prize. In the small space at the designer's disposal there is necessarily less opportunity for him to bring the same compelling force to bear upon the reader's mind. The presence of other announcements also has a weakening effect, but the quarter-page space in this series is, in our opinion, availed of to the fullest possible extent. Note how the direct question put to the reader-buyer is one always uppermost in his mind. The interest having thus been aroused, is well maintained. We especially commend the effective use that is made of diagrams. Though in point of boldness the series may not be all that the subject deserves, the limited space is well used.

Among the other examples included in Class 3, there were some which, while they compelled attention through boldness of design and directness of appeal, lacked certain other essentials. Some compelled attention, but did not maintain interest or excite further inquiry; some had no "story" to tell, or the story told was on the dull side.

The competition has, in our opinion, given a stimulus to the desire of advertisers and designers to produce work of a high standard. As the result of our examination of the 270 examples that were submitted by 45 companies and firms we feel that we must congratulate British advertisers upon the advance that they have made, for we believe it to be perfectly true that in the normal weekly issues of trade journals, either in this country or in America, there is no better advertising matter than has been brought together in this collection of announcements published in the Electrical Review between July and December, 1925.

We have been greatly impressed with the value of the whole-page advertisement as a means of fixing the reader's attention and affording the designer full scope for the exercise of his ingenuity and skill in effectively telling his story and illustrating the goods.

J. W. Beauchamp.
February 4th, 1926. L. L. Robinson.

Go to Birmingham!

Everything in regard to the future place of electrical products at the British Industries Fair depends upon the measure of success that attends our operations at Birmingham during the twelve days commencing on Monday next. The seventy or eighty exhibits that are now being prepared should make a powerful impression on the minds of the large number of visitors who are expected from overseas; and the collection of electrical articles brought together should make an atmosphere in which trade relations between home buyers and our firms should receive an excellent stimulus. The principal electrical day will be Wednesday next, 17th inst., when we hope there will be a large gathering of electrical men who have the ordering or specifying of goods. On other days delegations from electrical contracting and wholesale trading concerns will be present. We wish all exhibitors a very busy time, and urge all our readers who can manage to do so, to spend at any rate one day at Birmingham before February 26th.

The Lighting of Coal Mines.

The discussion on the above subject before the Illuminating Engineering Society on January 21st (reported elsewhere in this issue) was opportune, and raised many interesting points. Many data have been presented at different times to show the good results that have attended the introduction of improved electric lamps. It was, therefore, diquieting to note from Dr. T. L. Llewellyn's contribution that, in spite of these and other improvements in lighting, both nystagmus and cases of disability seem to have increased during recent years. This problem, like many others, is complicated by other considerations that tend to mask the effects of better lighting. The deranged condition of the industry accounts for a good deal, but in the meantime there are circumstances which have prevented the full advantages of electric lighting from being realised. Mr. E. Farmer, in his introductory paper, drew attention to one, namely, the tendency of naked filaments to glare when seen amidst the dark surroundings of the mine. Frosting the inside of the glass cylinder would seem to be a palliative, even though it causes some diminution in light. Another fact, commented on by Mr. T. J. Sack and others, is that a life of 1,000 hours, often demanded by colliery owners, cannot be expected from a miniature 2-volt lamp of reasonable efficiency; hence, underrun lamps, often furnishing even less than the legal minimum of 1 candle-power, are in use. It would pay handsomely to adopt lamps of a shorter life, but run at a higher efficiency, and there is also good prospect that miners will ultimately consent to use a somewhat heavier lamp, enabling 4-volt batteries to be employed and a higher candle-power obtained. In this event

gasfilled lamps may ultimately be used. Finally, there is the possibility, suggested by Prof. W. Thornton's researches, that low-voltage high-frequency currents, supplied by special cables, may eventually enable ordinary systems of electric lighting to be more widely installed in mines.

Railways and Rural Electrification.

WE referred in the closing paragraph of our leader of January 22nd to the electrification of the railways as an alternative method of carrying electricity supply into the country. There is not a centre of population in the whole country which is not within reasonable distance of a railway station. Consequently, if the whole of the railways were electrified, the whole of the country could be given a supply of electricity. That is a consummation attainable only after very many years; but the same is true of the method contemplated by the Government. Now, it is known that the railway companies are interested in the problem of electrification, and we have recently been told by more than one of their leading representatives that if it could be shown that electrification would pay, then they would be ready to adopt it. The companies are at present spending very many millions a year on new steam locomotives, rolling stock, and permanent way, which might equally be expended on electric locomotives and other electrical equipment. The North-Eastern Railway went so far as to build an electric main-line locomotive, and seriously considered the conversion of a large portion of its system to electrical operation. It appears, therefore, that the margin between profit and loss due to electrification is but a narrow one. It is worth consideration whether, if a portion of the capital scheduled for the Government scheme were devoted to the elimination of that margin, the electrification of our main-line railways and the concurrent electrification of the whole country might be brought about most economically and with the most beneficial results.

The point is that there is no necessity to find the whole of the enormous capital required to convert all our railways to electrical operation; a certain outlay would be justifiable on a strictly commercial basis, and up to that point the railway companies would be prepared to go, if there is any meaning in words. The additional capital required would be the difference between that amount and the actual cost, and if it were provided on similar terms to those offered to the proposed Executive Board—that is, with a Trade Facilities guarantee, and with sinking-fund suspended for five years—it would not only be readily obtainable, but would, we think, be at least as likely to become remunerative as the capital required for the national network and the standardisation of frequency. At the same time the combination of the railway load with that of public supply for lighting and power would greatly improve the load factor and enable the cost of energy to be reduced to a figure acceptable to the railway companies.

Unusual Dangers.

THE report which appeared in our last issue of a fatal accident due to a shock from the uninsulated collar of a lamp draws attention to a danger attendant upon the use of the screw-cap type of lamp which perhaps has not received sufficient consideration. It was stated that the unfortunate victim was altering the position of a high-power pendant lamp of this type whilst the cap of the lamp was alive; apparently, he received a shock of 230 volts alternating between the lamp cap and a steel girder, which ended fatally.

Even if such circuits were always wired with the switch on the live side, the danger would not be wholly removed, as it might be possible for a break to occur on the earthed side of the circuit, leaving the lamp cap charged through the filament. But even if this were not the case, no reliance could be placed on the wiring of the lampholder so that the lamp cap was on the earthed side, because at any time alterations might be made nullifying this precaution; it is also possible for the polarity of a whole installation to be reversed when work is in progress on the public mains. In the case of private self-contained installations neither pole may be earthed, and yet a fatal shock may conceivably be received from such a fitting.

Whilst we deprecate an alarmist policy where the risk is negligible, we think it must be recognised that there is a real danger to be dealt with here, and that provision should be made to prevent the recurrence of such an accident if possible—the most obvious course being to cover the exposed metal with an insulating coating.

A fatality recorded in our last issue, presumably due to contact with a radiator which had become "alive," is another example of those accidents in the bathroom which, more than any other class of accident, have marred the use of electricity in the home. Only in the bathroom, scullery or wash-house, and cellar is it normally possible, within reason, to bring about a fatal accident in the household, and, as we have repeatedly urged, the greatest care should be taken to limit the risk in such localities to the minimum. Portable apparatus should never be used in a bathroom.

Unfortunately electrical engineers have thought fit to impose the same precautions upon the use of electricity in other parts of a house where the risk is, humanly speaking, negligible. It is impossible to eliminate every conceivable element of risk in the use of electricity, any more than that of gas, coal, coke, oil, or even water. Who would ever have imagined that putting a pair of slippers under a radiator would bring about the death of the owner?

Interconnected Power Systems.

AN interesting article recently appeared in the *Electrical World*, of which an abstract is printed elsewhere in this issue, describing the methods adopted by a large electricity supply undertaking in the United States to obtain the advantages of interconnection between four power stations, without the drawbacks consequent upon the massing of plant aggregating 500,000 kW.

If the system were solidly linked up, the occurrence of a fault on any part of it would result in the discharge of an immense amount of energy into the fault, setting up a violent disturbance throughout the system. To obviate this, the "loose-linking" method has been employed, enabling the stations to assist one another when necessary or desirable, but limiting the effects of an uncontrollable disturbance to the minimum area. This end is attained, as explained in the article, by limiting the number of points at which energy may pass from one area to another, and by providing adequate automatic switchgear at each of these points. The installation of heavy switchgear at the power stations is being avoided as far as possible.

Wholesalers and Contractors.

THE general theme of the speeches at last week's dinner of the Electrical Wholesalers' Federation, which are reported in this issue, was an apprehension of the Government's intentions so far as the wiring of premises and the sale of electrical appliances are concerned. There appears to be a feeling that the Government intends to encourage municipal authorities to apply for full trading powers, and this fear may not be entirely without reason having regard to the decision in the Barrow, Bath and Burnley Corporations' Bills last July. Through Mr. A. G. Beaver, the Electrical Wholesalers' Federation expressed its determination to support the Electrical Contractors' Association in its fight against the granting of these powers, and at the same time Mr. Beaver warned manufacturers that it was not in their interest to adopt a neutral attitude. The contractors intend to get their blow in first if they can; the first manifestation of this spirit is the publication of a pamphlet, "Electrical Freedom," which is mentioned in our Business Notes.

The "Electrical Review" Advertisement Competition.

By J. W. BEAUCHAMP and L. L. ROBINSON.

In this competition there were examples of the modern advertising method in which a particular article is illustrated and supported by some decoration or sketch illustrating the idea for which it stands or work which it accomplishes.

This method is good, but in some of the examples the supporting ideas rather overshadow the actual article being sold, that is to say, the advertising agent or designer has become too much obsessed by his advertising technique, thus losing sight of the real object—to sell a certain article.

This is often noticeable to-day in the work of some agents.

It is seen again in poster work; the advertisers get so pleased with the fineness of their poster work that they produce something more likely to be appreciated by their brother advertising agents than by the public to which it is really addressed. The object and the supporting atmosphere should carefully be kept in their respective places.

We were impressed with the very high quality of all the stuff sent in, particularly the full-page spreads. Much of the best of the American advertising work was really embodied in these advertisements without making them too blatant and noisy.

In judging, a difficulty arose in comparing advertisements for heavy plant, highly scientific instruments and ordinary accessories. It would be easier if the advertisements were divided into classes.

It requires far more imagination to make a really telling advertisement out of some simple material or accessory than out of high-grade plant which lends itself naturally to effective pictorial treatment.

Some of the advertisements were very good because they were an appeal from a manufacturer to a retailer and pointed out how the retailer could make money by handling such goods.

Advertisements from the manufacturer to the retailer must go a little further than selling to the retailer, which after all is only half a sale—they should suggest how the retailer can "re-talk" the story to the ultimate user, or at least recommend him to get from the manufacturer some further leaflet or information on this very important point. Goods sold by manufacturers to retailers are really only half sold.

Some of the advertisements were a very happy combination of popular appeal and technical information—there is room for this sort of work in our industry; it not only sells the goods but also acts as a sort of unconscious text-book towards the buyer, increasing his technical knowledge in an easy way; as the suction cleaner says "It beats as it sweeps," we should say "The advertisement teaches as it sells."

In some cases the advertiser has forgotten that the reader of the technical paper is a busy man—or at least it is the busy reader who is a buyer. As he turns over the leaves, dozens of them, some feature must be provided to arrest his attention before consideration is given to the message which he is to read but will not read unless some outstanding feature has made him pause for a moment on that page. Here is the great advantage of the full page.

A few of the advertisements had a "carrying on" feature, they left rather a feeling that one should look for the next issue from the advertisers (this is important) or that one should write immediately for fuller details—the latter feeling is very important if it can be created, because if the writer immediately writes for something the seller gets his name on his file in connection with a certain subject, and then has all the material for follow-up work.

Few manufacturers perhaps expect to get a definite order right away from a particular advertisement, but if they can extract a letter from the potential buyer and so "start a file" with him, the rest should be easy. The seller then has a definite avenue of approach for his written matter and for his travellers.

The judges were glad that there was only one prize offered in each class; there was no real difficulty after serious consideration in adjudging the one first prize in each class, but it would have been very difficult to discriminate between Nos. 2, 3, and 4 had there been more prizes than one. The whole standard of the first half dozen in each class was very high.

Generally it was encouraging to note the absence of mere "superlatives" in the advertising, and the general expression of care and thought given to combine some arresting feature or statement with definite and valuable information as against the shrieking methods with which we were at one time threatened in engineering advertising.

The most interesting were those cases where a very scientific article or simple material, rather difficult to make a story with, had been treated.

Some of these less dramatic accessories or materials are of the utmost importance in electrical advertisements, and it is worth while bearing in mind that the firm that succeeds in putting across, for example, simple systems of wiring, good fittings, and things of that kind, is in a way advertising for all the other firms, much as E.D.A. by pushing electricity generally helps to sell dynamos, measuring instruments, and so on.

The almost entire absence of very noisy or rather vulgar advertisements was most encouraging—this class of thing may make people gape, but it sells nothing and lets down the standard of the whole business; the heroic figures, and more or less nude ladies and complicated sketches can safely be left to sellers of patent foods and similar articles.

Similarly, with the wording: "clichés," rhymed lines, and devices of that kind are no good in our business.

Copy should be terse, based on knowledge of the goods and belief in their utility. This, coupled with some imagination, placing the advertiser in the buyer's mental position, is most likely to produce results, and, generally speaking, the advertisements put before us represented this rather high-class, serious advertisement treatment in a very satisfactory manner.

Electricity in Agriculture.—After an extensive tour of America and Europe, Mr. H. P. Colwell, chief electrical engineer of the Victorian Railways, on returning to Australia in December is reported by the *Sydney Morning Herald* to have said that the rapid application of electricity to railways, industry, and agriculture in Europe had surprised him. During the war the price of British coal advanced to a prohibitive extent, and many European countries applied electricity to industries formerly dependent upon coal. Some of the farming districts, particularly those of Sweden, were remarkably well equipped with electrically-operated machinery, and he had seen consignments of electric ploughs sent from Germany to Russia. Where it was practicable to plough huge areas of land in one locality, the country was reticulated with electric cables, and ploughs were harnessed to electric tractors.

Hydro-Electric Enterprise in Canada.—During 1925 a total of 719,000 h.p. was added to the hydro-electric generating capacity of Canadian installations, bringing the total now operative to 4,290,000 h.p. Last year's installations represent a direct capital investment of $70,000,000, without regard to the new capital required to utilise the power. A further 1,000,000 h.p. at least is expected to be added during the current year. Quebec led in 1925 with a total of 439,000 h.p. in new installations; Ontario was second with 200,000 h.p., and British Columbia third with 59,000 h.p.—*Reuter's Trade Service* (Ottawa).

The British Industries Fair—I.

Electrical Features and Meetings.

On Monday next a trade event of the first importance commences simultaneously at London and Birmingham. It is natural to place London first, but from the point of view of the electrical industry that section of the British Industries Fair will be overshadowed by Birmingham.

As our readers know, special efforts have been directed towards the building up of a really representative electrical section at the Castle Bromwich Aerodrome, in which spacious buildings the Fair is housed. These efforts have borne abundant fruit; the list of exhibitors includes between 70 and 80 firms which are wholly or mainly electrical, and among them are the names of most of the leading concerns of the industry. We think, therefore, that electrical manufacturers will be represented in a manner fitted to their importance in the economic life of the State, and it is our earnest hope that the results obtained by them will more than justify their participation in this great trade show, which, it is hoped, will one day threaten the supremacy of Leipzig.

The Fair is designed, in the first place, to show foreign buyers what this country's capabilities are, and the whole of the organisation of the Department of Overseas Trade, and the Consular and Diplomatic Services, have, for the past few months, been spreading the idea and inducing traders in all parts of the world to visit England this year. Over 200,000 invitations have been issued to buyers in the Dominions and foreign countries, and to each two letters have been sent in his own language in the case of European and Latin-American countries. It may be of interest to mention actual figures; the following is a selection from an official list giving the country and number of buyers invited:—Australia and New Zealand, 2,000; Canada and Newfoundland, 2,168; South Africa, 2,256; Argentina, 1,145; Norway, 1,081; Sweden, 1,126; Holland, 1,600; the United States, 5,000; France, 2,892; Spain, 1,600; Italy, 3,000; Switzerland, 2,264; Balkan States, 1,000; and the Middle East, 1,000. It will be seen from this that every endeavour has been made to attract visitors from all the important markets, and the Department of Overseas Trade reports that the organisation of the Fair has received a remarkable response from representative buyers throughout the world. The opening of the Fair is thus taking place in most propitious circumstances, and everything points to success.

We have so far said nothing of the London section of the Fair. While, from our own point of view, this is of considerably smaller importance, it is by no means negligible. The radio industry is putting up a good show, there being a separate section for this purpose in which 33 firms have taken space. Having regard to the progress which the industry has made in the last year or two, there is no doubt that it now constitutes a very important branch of British production, and should secure a good share in foreign markets. Apart from the radio section, however, there will be many exhibits of electrical novelties and small electrical appliances at the White City, all of which play their part in the inculcation of the "electrical idea" and lead to bigger things.

The London list includes a number of the leading firms of radio apparatus makers, including the General Electric Co., Ltd., the British Thomson-Houston Co., Ltd., Burndept Wireless, Ltd., the M.O. Valve Co., Ltd., Marconi's Wireless Telegraph Co., Ltd., the Mullard Wireless Service Co., Ltd., the Marconiphone Co., Ltd., and S. G. Brown, Ltd., apart from a number of other firms which, although not so well known, do a tremendous business in radio apparatus.

The value of the Fair is to be enhanced by the seizing of the opportunity to bring together at the exhibition a number of trade associations and groups. We have already mentioned one or two functions which have been arranged, but we think that a brief *résumé* of the programme drawn up for the Birmingham section may be of interest and use to our readers. On Monday next (February 15th) the Lord Mayor of Birmingham will officially open the Fair, and on the following day the chief magistrates of other industrial towns will pay a visit at the Lord Mayor's invitation. On the same day (February 16th) an official visit will be paid by the Birmingham Association of Building Trades Employers. Wednesday, February 17th, is an "electrical" day, when a number of associations representative of associations in all branches of the industry will attend the Fair. Among the bodies who have notified their intention of taking part are the Institution of Electrical Engineers, the Incorporated Municipal Electrical Association, the Association of Mining Electrical Engineers, the Provincial Electric Supply Committee of the United Kingdom, and the Association of Electric Power Companies (Inc.). On February 18th official visits are being made by the Midland Builders' Federation and the Ironmongers' Federated Association, while there will also be a conference of Midland Gas Departments. The Duke of York will be at the Fair on February 19th, and on the same day the Sheffield Chamber of Commerce will pay an official visit.

On February 23rd official visits are to be paid by the National Hardware Association, the Export Merchants' Section of the Chamber of Commerce, the Ironmongers' Federated Council, and the Electrical Association for Women. Wednesday, February 22nd, is another "electrical" day, when the principal officers and local branch secretaries of the Electrical Contractors' Association will inspect the exhibits. The President and Council of the Electrical Wholesalers' Federation will be there, and the Birmingham and District Master House Painters' Association will also pay an official visit. The last official visit in the programme is that of the Liverpool Chamber of Commerce on February 25th. The Fair closes on February 26th.

In London an important banquet will take place on the evening of the opening day. The Mansion House has been lent by the Lord Mayor for the occasion, the President of the Board of Trade will preside, and the Prince of Wales will be the principal guest.

From the above list of functions it will be seen that while the foreign markets have been intensively cultivated, our all-important home market is also to be fostered by the visits of a number of representative bodies of users of manufactured products, as well as exporters who are an indispensable link in the chain of foreign trade relations.

The Birmingham Corporation is also rendering active assistance in the organisation of the Fair. It will be appreciated that the power supply to such a large aggregation of exhibits and arrangements requires very special attention, and the Corporation Electric Supply Department has carried out the work well. The Corporation has also taken a large amount of space as an exhibitor. The Electric Supply Department is to have a display exemplifying the use of electricity in a number of diverse directions. The principal exhibit will be a 184-kW mercury-arc rectifier substation. This is of the type employed in outlying areas to convert 25-cycle a.c. at 5,000 V to d.c. at 220 and 440 V. A transformer sub-station, as installed on the premises of large consumers, is also to be shown. This type consists of a 100-kVA transformer with the necessary h. and l.p. switchgear, to step-down the pressure from 5,000 V to 440 V three-phase and 110 single phase. Other exhibits will be electric furnaces, a coal-cutter, static condensers, bench drills, &c.

Electricity Supply in Great Britain.—XI.*

Lincoln, Rutland, Norfolk, and Suffolk.

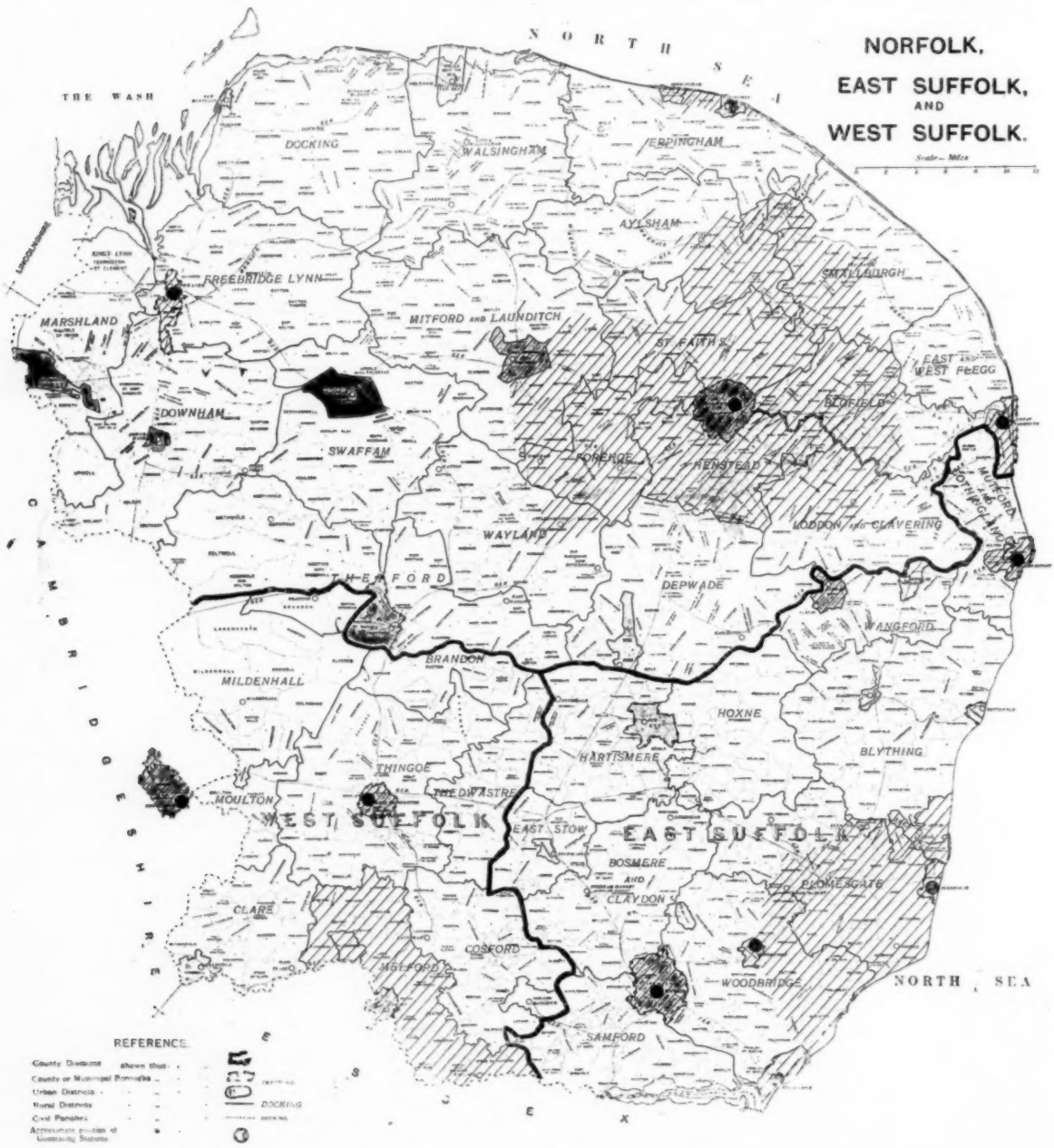
THE above Counties (except such parts of Lincolnshire as are included in the North-East Midlands provisionally determined Electricity District), together with the Counties of Cambridge, Isle of Ely, Huntingdon, Soke of Peterborough, and such parts of Essex as are not included in the London and Home Counties Electricity District, form Area No. 18 of the Fuel Consumption Analyses Report of the Electricity Commissioners, published annually by H.M. Stationery Office (price 1s. 6d.).

Table 8 gives the following totals for this Area :—

Year ending 31st March.	Area No. 18. kWh generated.
1922	72,728,485
1923	90,663,814
1924	107,370,713
1925	121,939,441

These figures include the kWh generated by Peterborough Corporation, Cambridge E.S. Co., Ltd., Wisbech E.L. & P. Co., Ltd., and by the undertakers in Essex outside the London and Home Counties' Electricity District, as well as the kWh generated at the stations shown on the accompanying maps.

The County of Essex was reproduced in No. 3 of this series, and the Soke of Peterborough was included in the map which accompanied the first of the series. With regard to the Counties of Cambridge, Huntingdon, and the Isle of Ely, it is not proposed to publish the maps, as the whole area is being applied for by the promoters of the Bedfordshire, Cambridgeshire, and Huntingdonshire Electric Power Bill.



Electricity Supply in Norfolk and Suffolk.

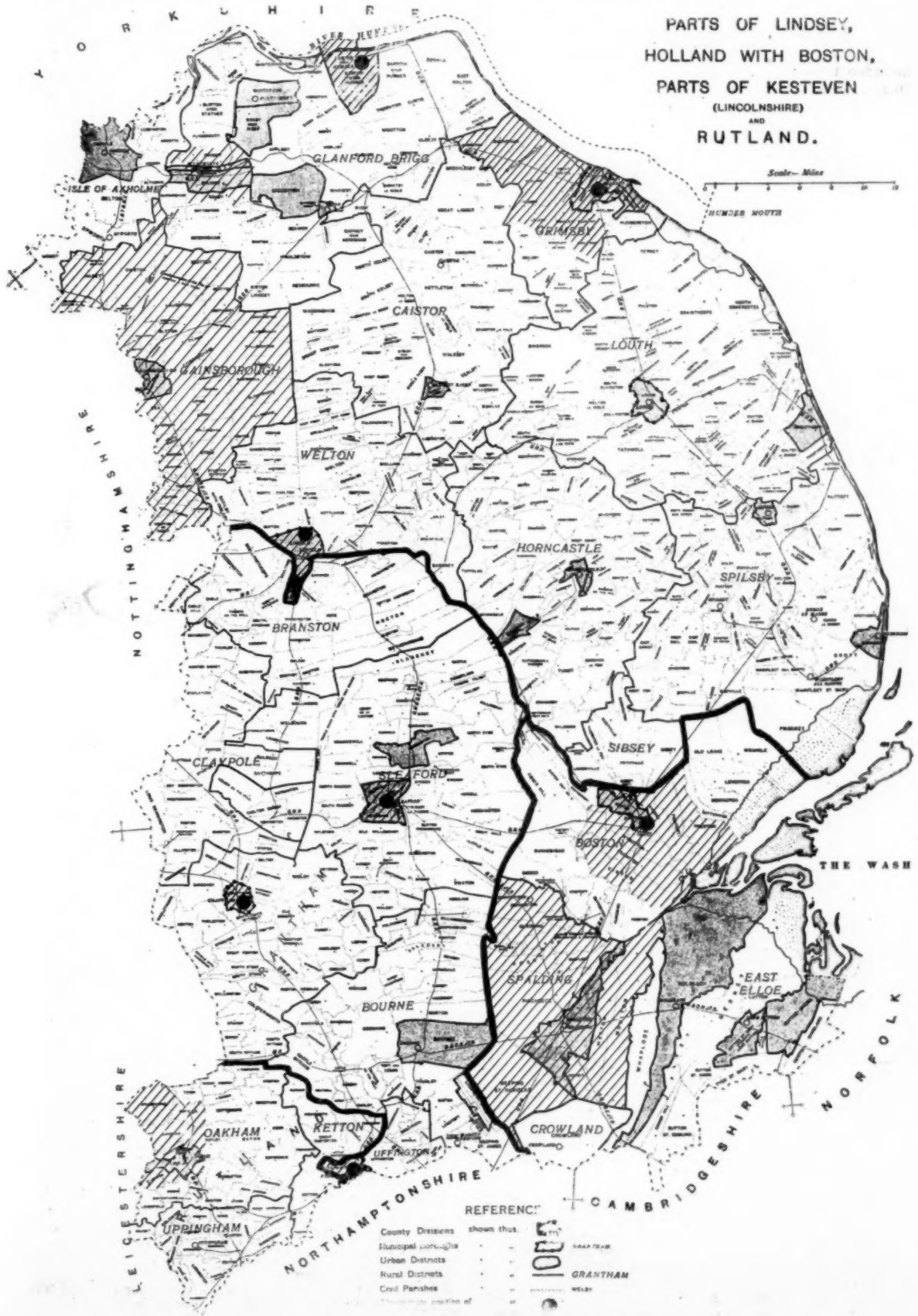
The following is the list of existing authorised

*Parts I-X of this series appeared in the ELECTRICAL REVIEW of October 9th, 16th, 23rd, and 30th, November 13th and 20th, December 11th and 25th, 1925, and January 15th and 29th, 1926.

undertakers, whose areas are shown hatched on the accompanying maps:—

Local Authorities.

Bury St. Edmunds Corporation.
Cleethorpes Urban District Council.
Felixstowe Urban District Council (undertaking operated by a company).
Great Yarmouth Corporation.
Grimsby Corporation.
Ipswich Corporation.
King's Lynn Corporation.
Lincoln Corporation.
Lowestoft Corporation.
Norwich Corporation.
Scunthorpe and Frodingham U.D.C.
Sleaford Urban District Council.



Electricity Supply in Lincolnshire and Rutland.

Companies.

Aldeburgh Electric Supply Co., Ltd.
Barton-on-Humber Electric Supply Co., Ltd.
Boston and District Electric Supply Co., Ltd.
Brundall and District Service Co., Ltd.
Edmundsons Electricity Corporation, Ltd.
Newmarket Electric Light Co., Ltd.
Oakham Gas and Electricity Co., Ltd.
Sheringham and District Electricity Supply Co., Ltd.
Urban Electric Supply Co., Ltd.
Woodbridge and District Electric Light Co., Ltd.

Cleethorpes Urban District Council obtains a bulk supply from the Great Grimsby Street Tramways Company, and Scunthorpe and Frodingham Urban District Council purchases its supply from a private company.

The Urban Electric Supply Co., Ltd., has separate undertakings, each with its own generating station, at Grantham and Stamford. Norwich Corporation is supplying in bulk to the Brundall and District Service Co., Ltd., and the Sheringham and District Electricity Supply Co., Ltd., is arranging to take a bulk supply from Edmundsons' generating station at Cromer.

The remaining undertakers possess their own generating stations, as indicated on the maps. It will be seen that there is no Power Company included in the above list of undertakers, and at the present time no part of the area of either map comes within any Power Company's territory, although part of north-west Lincolnshire is included in the North-East Midlands Electricity District as provisionally determined by the Electricity Commissioners. The areas applied for have also been hatched on the maps; the names of the promoters concerned are as follows:—

East Anglian Electricity, Ltd.
Orford Electric Light and Power Co., Ltd.
Spalding Urban District Council.
East Dereham Urban District Council.
Gainsborough Urban District Council.
Bungay Urban District Council.
Nottingham Corporation (Extension).

Particulars of applications are given in the Electricity Commissioners' Annual Reports and in the *London Gazette*.

The 1921 Census gives the following particulars for the districts shown on the accompanying maps:—

Administrative County with associated County Boroughs.	Acres.	Persons.	Resident families.	Buildings not containing dwellings.
Lincolnshire, Parts of—				
Holland ...	263,120	85,254	20,434	1,570
Kesteven ...	469,377	108,250	25,823	2,175
Lindsey ...	972,796	408,698	95,148	8,723
Rutland ...	97,273	18,376	4,531	369
Norfolk ...	1,315,064	504,293	121,783	8,747
Suffolk, E. ...	557,353	291,073	67,912	4,484
Suffolk, W. ...	390,916	108,985	27,570	2,053
Total ...	4,065,899	1,524,929	363,201	28,121

Similar particulars for the Administrative Counties of Cambridge, Huntingdon and the Isle of Ely give the following totals:—

Acres.	Persons.	Resident families.	Buildings not containing dwellings.
787,226	258,160	64,090	4,762

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Since 1917 the following alterations to areas, &c., have been made:—

(1) The Urban District and Parish of Scunthorpe and Frodingham has been created by uniting parts of the Parishes of Appleby, Ashby, Crosby, and Flixborough, and parts of the Urban Districts and Parishes of Brumby and Frodingham and Scunthorpe. The remainder of the Parish of Ashby was transferred to the Parish of Burringham, the remainder of the Parish of Crosby to the Parish of Flixborough, and the remainder of the Parishes of Scunthorpe, Brumby and Frodingham were united to form the Parish of Brumby Rural.

(2) The Borough and Parish of Lowestoft has been extended so as to include the Urban District and Parish of Oulton Broad.

(3) The City and County Borough and Parish of Lincoln has been extended so as to include the Urban District and Parish of Bracebridge, the Parish of Boultham, and parts of the Parishes of Bracebridge Heath, North Hykeham, and Skellingthorpe.

(4) Parts of the Parishes of Humberston and Weelsby have been transferred to the Urban District and Parish of Cleethorpes, and a part of the latter has been transferred to the Parish of Weelsby.

(5) The Urban District of Broughton has been abolished, and the Parish of Broughton has been included in the Rural District of Glanford Brigg.

(6) The Parishes of Thetford Saint Cuthbert, Thetford Saint Mary, and Thetford Saint Peter have been united to form the new Parish of Thetford, co-extensive with the Borough.

(7) The Urban District of Mablethorpe has been extended so as to include the Parishes of Trusthorpe and Sutton-le-Marsh. The name of the extended Urban District has been altered to the Mablethorpe and Sutton Urban District.

(8) The Parishes of Saxlingham Nethergate and Saxlingham Thorpe have been united to form the new Parish of Saxlingham Nethergate.

(9) Part of the Parish of Heacham has been transferred to the Urban District and Parish of New Hunstanton.

(10) Parts of the Parish of Gosberton have been transferred to the Parishes of Surfleet and Quadring; and parts of the Parishes of Surfleet and Quadring have been transferred to the Parish of Gosberton.

Wave Power Utilisation.

Brief Particulars of a Bulgarian Experiment.

In view of the efforts that have been made for many years past to devise some practical means—both from the point of view of economy and efficiency—of utilising the power of the tides for the generation of electricity, it is interesting to learn that some trials are at present being carried out at Varna, on the Black Sea, by a Bulgarian engineer named Athanas Vodenitcharoff, with a machine which he has devised. The engineer in question has been at work on the subject for the past thirteen years, during which period tests have been made with many different forms of wave-utilisation motors. The sixth device of the kind, installed at the breakwater of the Black Sea port of Bourgas in 1924, gave such promising results that M. Vodenitcharoff was

Fig. 1.—Wave Power Plant at Varna.

at last successful in securing the interest of a group of financiers who, early in 1925, organised the Syndicat pour Utilisation des Vagues Marines par le Moteur "Ouragan," with offices in Sliven, Varna, and Sofia. With the assistance and under the auspices of the Syndicate, M. Vodenitcharoff is now putting the finishing touches to a larger and more ambitious installation at Varna, of which we are able to reproduce a couple of photographs.

Owing to the question of patents in the different countries having still to be settled, it is not possible to publish full details of the arrangement adopted. From the particulars we have been able to obtain and from

the illustrations, however, we gather that the installation comprises a staging of iron or ferro-concrete construction, a series of floating elements which the inventor terms "power centralisators," a receiver and transmitter, with counterpoise, of the horizontal movements of the waves, a corresponding receiver and transmitter of the vertical movements, mechanism for converting the horizontal and vertical movements into rotary motion, an accelerator, flywheel, and adjusting gear, together with supplementary gear such as automatic pumps, dynamos, transformers, accumulators, &c.

M. Vodenitcharoff, who in the Bourgas experiment demonstrated his ability to provide electric lighting and power from the waves by a small motor which is now to be seen in the Marine Museum at Varna, claims that the success he has achieved is due to the fact that the Ouragan motor utilises four distinct movements of one and the same wave, *viz.*, the moment of rise on the advance of the wave, (2) the moment of descent of the floating member or power centralisator on the passage of the wave, (3) the moment of the horizontal stroke of the wave irrespective of its direction, and (4) the moment of return of the floating member on the passage of the wave. The experiments at Varna are being watched with great interest by Bulgarians from the King downwards. A provisional British patent has, we understand, already been applied for.

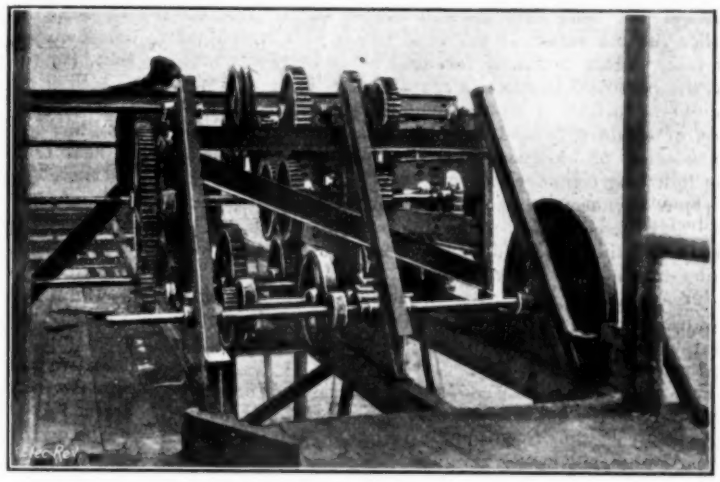


Fig. 2.—Gearing of Wave-operated Motor.

Boiler-Room Practice.

Coal Flow, Air Flow, and Steam Flow.

By JOHN BRUCE.

ONE of the most desirable features of modern boiler-house operation is the facility to readily determine, or express in such a manner as to be easily understood by all the boiler-room operatives, the instantaneous efficiency of conversion of the potential heat energy in the coal entering the boiler furnaces of any individual boiler unit.

While it is now generally recognised that a boiler plant can only be efficiently and scientifically operated from the interpretation of certain data, recorded or indicated by modern boiler-room instruments, it may be found that even with a comprehensive instrument equipment, only a trained combustion engineer can make the interpretations necessary to state the efficiency of conversion at a particular moment. An instrument panel equipped with a multiplicity of temperature indicators, draught gauges, CO_2 recorders, and steam and water flow meters, may easily prove the reverse of helpful to the average operator in the modern boiler room. Instead of facilitating the operation of coal-consuming equipment purposely installed to save coal, the complexity of instruments and the difficulty to the average operator of reconciling the various indications results in inefficient operation; the instrument equipment and the operator are condemned, and the boiler room becomes the sepulchre of possibly half a dozen different instrument makers' productions.

When deciding the equipment to be mounted on a boiler unit instrument panel, the average engineer is inclined to forget the fireman's or boiler operator's limitations, especially if the allowance for instruments permits a certain prodigality in this direction.

It is admitted that the day of muscle and brawn as recommendations for a boiler-room job are over, and that a different type of man, in whom intellect is looked for as a predominating feature, is being attracted to this section of power station work.

This new type of boiler-room operator, while certainly prepared to operate the plant in his charge to a combustion engineer's instructions or from instrument indications and the physical appearance of his fires, has still one thing in common with his predecessor, and that is the natural desire for simple, easily read, and easily understood gauges. The average fireman of ten or twenty years ago was content with the B.O.T. standard fittings for indicating steam pressure and water level, and the measure of his efficiency was very often based on the tonnage handled by his shovel and his ability to keep the needle of the pressure gauge on the "mark."

The modern type of fireman, or rather boiler attendant, asks that the modern "efficiency" instruments with which his boiler plant is equipped shall be few in number, easily read, and easily understood; and, instead of having to reconcile a dozen different indications, it should be possible for him to tell, from one or a combination of two indications, that the conditions under which the unit is being operated are consistent with maximum efficiency and economy. The ideal of one instrument or gauge as an indicator of overall boiler unit efficiency is not so Utopian as at first sight appears, and in this article it is proposed to discuss in particular the combination of measurements necessary to give this information.

In previous articles dealing with boiler-plant operation it has been pointed out that if comprehensive records of operation are to be made, the instrument equipment must necessarily be capable of providing all the data involved in the tabulation of a heat balance statement. It does not, however, follow that the plant could not be operated equally efficiently with fewer instruments, provided that such instruments give all the information necessary for the control of the variable factors influencing minute to minute operation.

The function of any steam boiler is the absorption of heat liberated from the combustion of fuel in a specially

designed furnace, the heat absorbed by the boiler being finally transmitted, by conduction and convection, to the water and steam contained therein. The performance, or efficiency, of the complete process is then the ratio of the heat units carried by the steam from the boiler (as the result of the combustion of unit weight of fuel) to that available for absorption as represented by the potential heat units contained in the same unit weight of fuel. The modern boiler unit for the generation of steam produced from the heat liberated by the combustion of coal may consist of a combination of the following components:—

(1) A furnace for the combustion of coal, designed and arranged to ensure that the heat liberated will be produced and presented to the heating surfaces of the boiler in the most efficient manner.

(2) A boiler, or water container, arranged in such a manner relative to the furnace that the heat presented by the furnace will be absorbed by the water rapidly and efficiently.

(3) A steam superheater, usually arranged as an integral part of the boiler, and designed to absorb heat by the heat-carrying medium, additional to the heat already absorbed by the water.

(4) An economiser, or in other words, feed-water heater, usually designed and arranged as part of the boiler unit total heating surface, its function being the absorption of heat from the gases of combustion after the latter have left the heating surfaces of the boiler. The heat thus absorbed is taken up by the water on its way to the boiler.

(5) An air heater designed and arranged as a component part of the combined boiler unit. The function of the air heater is the absorption of heat from the gases of combustion after these gases have left the heating surfaces of the economiser or boiler.

If the foregoing components of a boiler unit are arranged in the order stated, the air heater reduces the gases of combustion to the final temperature at which they will be discharged to the stack and atmosphere.

The heat absorbed by the air heater is taken up and carried by the air being supplied for the process of combustion of the fuel, thus reducing the endothermic work of the furnace, and diverting the commencement of the thermal cycle to a point in the path of the waste gases.

While the foregoing combination of equipment has been stated as representative of modern boiler-room practice, it should be pointed out that certain variations exist with relation to items 4 and 5.

Air heaters have not yet been widely adopted, and where they are installed it is not always in combination with a water economiser.

The operation and the resultant performance of a boiler unit consisting of the various combinations of equipment described are governed by certain factors over which the operating engineer should have perfect control. These factors have been discussed at length in previous articles, and for the present purpose we need only consider them briefly here.

On the assumption that the separate components of a boiler unit are correctly designed and so arranged in relation to each other that with the correct operating conditions the resultant performance will represent maximum attainable efficiency, and that the whole of the unit is in first-class mechanical condition, it can be shown that the overall performance is, practically, entirely dominated by the performance of the furnace.

The duty of the furnace, which term includes the combustion chamber and setting, is the liberation of heat units from the combustion of the coal and the efficient presentation of these liberated heat units for their rapid absorption by the other components of the unit.

The performance of any correctly designed and erected stoker and setting, as far as combustion efficiency is concerned, is, generally speaking, governed by two variable factors. These two factors are:—(1) rate of coal flow, (2) relative rate of air flow. These two variables result in one factor, rate of liberation of heat units.

The function of the heat absorbing components of the unit is the rapid absorption of the liberated heat units, and again assuming correct design and setting and cleanliness of internal and external heat transmitting surfaces, the resultant performance of this section of the boiler unit is influenced by two variable factors. These are (1) temperature of resultant gases of combustion, (2) velocity of resultant gases of combustion.

A high temperature gradient is necessary for efficient heat transfer, and temperature is therefore the predominating factor, since it influences all three methods of heat transmission—radiation, convection, and conduction.

Temperature is directly dependent upon furnace performance, and therefore the efficiency of the boiler unit is practically entirely influenced by the variable factors governing the operating temperature of the furnace.

Mechanical and physical properties of the materials used in the construction and setting of the modern mechanical stoker place, however, a limit to the temperature at which automatic stoker plant can be commercially operated, a compromise usually being arrived at between efficiency and maintenance.

The perfect combustion of a given fuel results in a definite maximum elevation of temperature above that of the original fuel and that of the combining weight of air supplied for combustion. This theoretically possible temperature is never attained in the furnace of an ordinary boiler unit, for the following reasons.

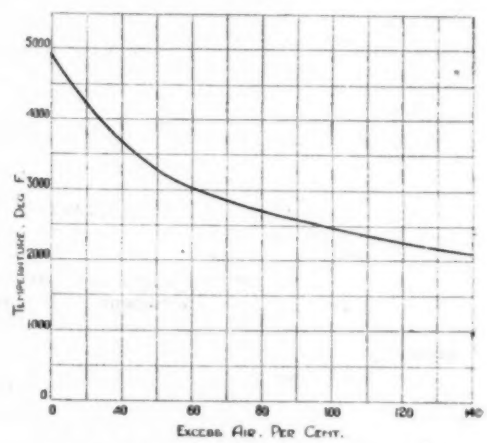


Fig. 1.—The Effect of Excess Air on Temperature.

In commercial practice it is impossible with the present types of equipment to effect complete and rapid combustion with the theoretical amount of air, and the necessity for the introduction of air quantities in excess of the theoretical, results in the dilution of the products of combustion and a consequent lowering of the temperature theoretically attainable.

In other words, the furnace temperature and the temperature of the resultant products of combustion are dependent upon the excess air quantity with which the process of combustion has been effected.

Under ordinary conditions of commercial operation necessitating the introduction of a certain excess air percentage, there will be in the gaseous products of combustion certain amounts of oxygen and nitrogen remaining uncombined. This excess oxygen and nitrogen must be heated from the initial temperature to a temperature equal to that of the gaseous products of combustion.

They thus rob the actual combustion products of a definite amount of heat, with the result that the actual mixture has a temperature lower than the theoretical. Considering in the meantime only this aspect of the question, it will be seen that furnace temperature and the temperature of the gases presented to the boiler are dependent upon the percentage of excess air utilised in the process of combustion.

The theoretical temperature attainable is also further reduced due to loss by radiation to bodies other than those of the useful heat-absorbing components of the boiler unit, and the decrease in temperature due to this

source is a function of the time taken for the complete combustion of a given mass of fuel.

Further, the restriction of the supply of air to values below that found necessary for commercial operation will produce temperatures below the theoretical, since, under these conditions, the heat generated will be less than that amount due to the carbon content burning to CO instead of CO_2.

Generally speaking, it can be stated that reducing the excess air will result in raising the furnace temperature, or in other words, if a furnace is operated at a point just below its critical point of combustion, which with modern equipment corresponds to 35 per cent. to 40 per cent. excess air (13 per cent. to 14 per cent. CO_2) it can be taken for granted that the furnace temperature and the temperature of the furnace gases are at their highest commercially attainable value. The curve in fig. 1 has been plotted from computations made for a theoretical case, and while not strictly accurate, since the effect of radiation is not included, it serves to show the approximate relation between attainable temperatures and air quantities involved in the combustion of a given coal.

To sum up what has been said, we can state that, assuming a mechanically perfect boiler unit and the complete oxidation of the combustible constituents of the fuel, the factor dominating boiler plant performance is the control of air flow in correct relation to fuel flow.

Before considering at length what relationship exists between rate of flow of air, heat generated, and useful heat absorbed, it should be pointed out that the boiler-room operating crew must fully understand the meaning of the indications given by the simple instruments used in boiler operation for the measurement of air pressure and air flow. The simple U-tube draught gauge, though not an actual air flow meter, is nevertheless an instrument of precision of equal importance to the steam flow meter and other elaborate boiler-room metering apparatus, and for the proper application of the information given by these instruments, a common-sense knowledge of the general principles of gas and air flow is necessary.

The meaning of the word "draught" is liable to be misinterpreted, in cases where a boiler unit is equipped with both "U"-tube and differential pressure gauges.

In boiler-room work, draught means an elevation or depression of pressure in relation to the pressure of the atmosphere, and does not in itself directly represent a definite relation to air flow, unless the value of such draught is considered along with fuel bed or gas pass resistance.

Differential pressure gauges are employed to indicate the drop in pressure between two points, as for example, the drop in pressure through the firebed, or the drop in pressure from the combustion chamber to the uptake.

It can be shown that if the air or gases flow through a path having a constant resistance, the pressure drop between two points in that path will be a measure of the rate of gas or air flow.

On a modern boiler unit with an efficient equipment of soot blowers, the gas passes of the unit can be considered as a path of constant resistance, and a differential pressure gauge connected to indicate the drop of pressure across this path will, therefore, be a gas flow meter, capable of giving measurements of acceptable accuracy for commercial operation.

For the control of furnace conditions, a combination of differential gauges and Pitot tube manometers can be profitably utilised.

The Pitot tubes are inserted in the forced-draught ducts carrying air to the grates, and the differential pressure gauges are connected to indicate the pressure drop through the fuel bed. Care must be taken when interpreting this pressure drop, for the instrument is not now measuring the pressure drop across a path of fixed resistance, and the indications given by the gauges will be affected by variations in the thickness of the fuel bed, due either to intentional operation or irregular combustion.

This combination of instruments for the measurement of furnace air conditions can be utilised to equal advantage even though the unit is equipped with more than one grate, necessitating two or more forced-draught ducts.

(To be continued.)

All-Electric House Developments.

Some Features of the Experiments at Woolwich and Ilford.

So much has been said on the subject of "all-electric" houses which is controversial and based on the estimates of various people interested in the subject, that any data taken from actual experiment or practice are particularly welcome. The recent developments in this direction at Woolwich and Ilford have enabled us to collect information which may prove of interest and value not only to electrical engineers, but to many connected with the building trades, and at the same time confirm the view already expressed that the all-electric house is a practical proposition.

Four such houses have been in occupation now at Woolwich for over 12 months. They have been erected on the Eltham housing estate of the Woolwich Borough Council, where there are at present over 600 six-room houses completed and occupied and others in the course of erection. It is interesting to note in passing that, although only the four houses referred to are "all-electric," all the other houses on the estate are equipped for electric lighting and cooking, the tenants being charged a flat rate of 2d. per kWh for all the electrical energy consumed.

As a safeguard the Borough Council included one chimney in the construction of each of the four experimental houses, but the bases of these have been built in, fig. 3, and coal fires have never been installed. The claim that in the "all-electric" house the saving on the cost of construction, due to the elimination of chimneys and chimney breasts, is sufficient to provide for the necessary electrical apparatus, has been substantiated in each building, although one chimney is included. The houses are semi-detached and contain six small rooms and a bathroom. Each electric installation includes nine lighting points, complete with pendants and holders; heating plugs in all bedrooms, living room and parlour; one 3-kW fire fitted with a hot receptacle for plates; one 600-watt bowl fire; one full-range cooker; one wash boiler and water-heating apparatus. The equipment in each house is similar, with the exception of the water-heating apparatus and wash boiler; these vary slightly, with a view to ascertaining the most suitable form of apparatus. The heating elements for the wash boilers are either clamped to the bottom of the boiler or fitted as immersion heaters, and are of 4-kW maximum capacity with 3-heat regulation. A hot-water tap supplies the boiler from the storage tanks.

In each of two of the houses two storage tanks are fitted, one serving the sink and wash boiler in the scullery and the other the bath and hand basin in the bathroom. In the other instances only one tank is provided in each house to serve both the scullery and the bathroom. The tanks are all fitted with low-wattage heaters, which must be connected to the supply either continuously or for 12 to 14 hours before hot water is required.

In one case the tank is provided with rather unusual heating arrangements. Two elements are included, one of 125-W loading for continuous service,

and the other, of 1,000 W, for boosting purposes. These are arranged externally to the tank in such a way that the small element heats the water in the top half and the boost provides for the lower half. This is brought about by creating a separate water circulation in each half of the tank; the element is housed in a cylinder with pipe connections to the top and bottom of the half of the tank in question, the water path being

Fig. 1.—Main Switch and Prepayment Meter.

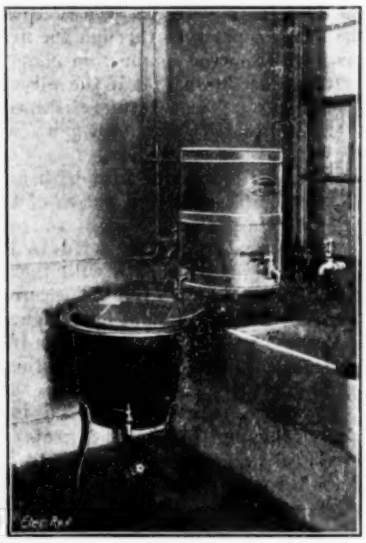


Fig. 2.—Electric Geyser and Wash Boiler.

through the cylinder. The capacity of this tank, which serves the whole house, is 20 gallons. In one of the other houses are fixed two atmospheric tanks, each fitted with a ball cock for the cold water supply, one being placed in the scullery and the other on the first floor outside the bathroom. Each is equipped with an electric immersion heater. These tanks are different to the others in that practically the whole of the water is available for use at its inside temperature. This is due to the small inflow of cold water through the ball cock, which is purposely so adjusted. In another case the hot-water flow from the tank is regulated by the cold water tap so that the input and output are always the same.

Of the tenants occupying these houses two were nominated by the Electricity Committee and two by the Housing Committee of the Corporation. Three of these are non-technical people, and hence the consumption figures which have been obtained from the four houses may be taken as representing the normal use of electricity in the ordinary home. The ordinary flat-rate charges which are adopted by the Electricity Undertaking, per kWh, are—lighting 6d., heating and cooking 1d., and water heating 0.5d. Two systems of metering the consumption of the "all-electric" houses are being employed. In one the amounts of energy used on the various services are charged on the above-mentioned tariffs by a novel method which was originated by one of the staff, but only one meter is used. This is effected by introducing a current transformer with two tappings into the heating and cooking, and water-heating circuits with the secondaries connected to the series coil of the meter. The transformers are of 12 to 1 and 6 to 1 ratios for heating and cooking, and water heating, respectively. Thus the actual amounts which pass through the meter, charged at 6d. per kWh, are equivalent to the total amounts consumed and charged at the relative flat rates. This method results in the correct total charge being arrived at although the actual amounts of energy consumed are not given. The second system of charging is based on estimated proportionate relative consumptions on the different services for the ordinary household, by which a figure of 0.8d. per kWh for the whole supply is arrived at. The whole of the supply is controlled directly by one meter. Prepayment meters are installed in all the houses, and the following figures of consumption and revenue for the four houses (*a*, *b*, *c* and *d*) in question, covering a period of 13 months ending in December last, are of interest. (*a*) 7,327 kWh, £30 8s. 10d.; (*b*) 7,495 kWh, £31 4s. 3d.; (*c*) 5,509 kWh, £22 19s. 5d.; (*d*) 6,493 kWh, £27 1s. 3d. The above money amounts represent the revenue collected at the rate of 1d. per kWh, and were subject to a 20 per cent. rebate. This results in an average cost of £22 6s. 9d. for 13 months for lighting, heating, cooking and water heating—not, in most cases, an impossible or an uneconomical figure.

With the object of obtaining reliable and first-hand information regarding the practicability of the all-electric house, the Ilford Electricity Department has embarked upon an experimental scheme for which it is entirely responsible. Twelve all-electric houses have been provided, and these are owned by the Department, and are to be rented by its own employés. The houses are built somewhat on the lines of those of the usual Government housing schemes, with six small rooms, including a scullery and a bathroom. One coal fire is provided for in each house, although the necessary equipment for the electrical alternative is installed. A hot-

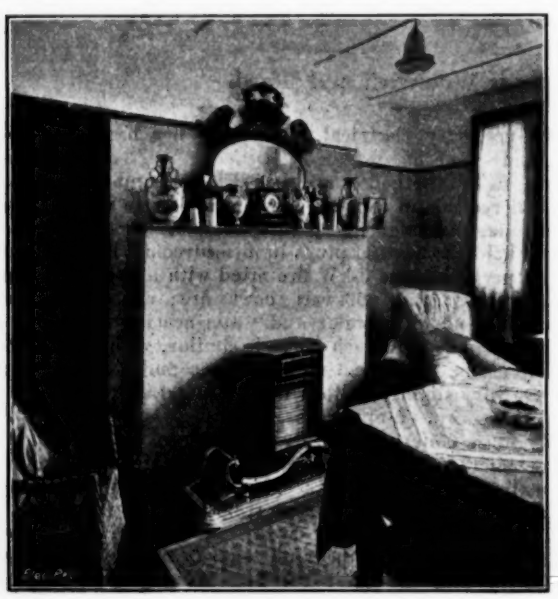


Fig. 3.—Sitting-room.

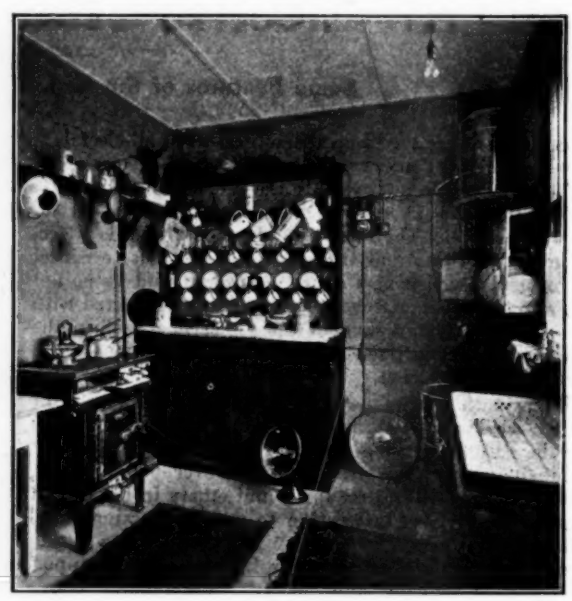


Fig. 4.—Kitchen.

All-Electric Houses at Woolwich.

water supply system is provided, and the water may be heated either electrically or by the coal fire. This is effected by the provision of two 1-kW immersion heaters in the circulation tank, with the result that the water may be heated wholly by either electricity or the coal fire, or the electric heaters may be used as a boost after the water has been brought to a certain temperature by the older method. This arrangement should prove a means of surmounting some of the objections to electric water heating met with in many places.

Each room is equipped with points for both lighting and heating, and two fires, one 2-kW bar-radiator and a small bowl fire, are provided in each house. In addition, the following apparatus completes the electrical equipment of each dwelling :—A full-range cooker (including an electric kettle), a wash boiler, and an iron. The whole of the hire and consumption charges for each consumer are covered by a fixed rate of 2s. per week, plus 0.75d. per kWh for the energy consumed. It may prove of interest to compare these figures with those of the ordinary all-in supply rates of the undertaking, *viz.*, 12.5 per cent. of the rateable value of the residence and 0.75d. per kWh. The houses have not yet been occupied for a sufficiently long time for any useful consumption data to be collected, but we look forward with interest to obtaining these at a later date. As in the case of the Woolwich houses a saving, amounting to the cost of the electrical apparatus, has been made on the construction of each house, the building cost of which amounted to £780. Special ventilation arrangements have been included in the houses, ventilating ducts connecting each room to a brick chamber and cowl mounted on the roof. For demonstration purposes one of the houses has been fully furnished, and is on view to the public for a period of three months which commenced on January 25th. It is interesting to note that during the first week of inspection about 750 persons visited the house.

The Issue of Material Supplies.

A Procedure to Minimise Delay.

By W. J. HISCOX.

DELAYS in production are often due to lack of material supplies, despite the fact that most sizes of material are stocked upon a maximum-minimum basis. Apart from this, there is the tendency of the modern planning department to insist upon sizes which hitherto have not been stocked, with the idea of reducing machining costs and thus increasing the capacity of the machining department.

With regard to sizes of material deemed to be in stock, failure of supplies is due chiefly to error occasioned by faulty stock records, for if orders are not booked until three or four days have elapsed since the issue of the material, it is obvious that in very many cases new supplies are not requisitioned until existing stocks are practically exhausted, and the buyer is unable to get in the new supplies before this happens. The only way to eliminate this trouble is to insist upon all issues being posted to the record cards daily.

MATERIAL REQUISITION

JOB No. ..... DATE ..... PART No. .....

Amount	PARTICULARS	C.	Qrs.	lbs.	Rate	£	s.	d.
	Issued by Recd. by							

Fig. 1.—Requisition Form.

Another factor is that in many cases the ordering point is fixed too low. It was probably fixed when the volume of work was much less than it is to-day, and no allowance has been made to meet the demands of increasing business. It is the case sometimes that the ordering figure is much less than the amount of material required for one single issue, and it is necessary, therefore, that in progressive works, the ordering figure should be revised from time to time.

Delay occasioned by the planning department insisting upon a size of material not hitherto stocked being used can be minimised by advance instructions being sent to the store, so that requisitions for supplies can be sent to the buyer before the material is actually required. For the most part, the store receives information only when the requisition is received, which means that the material is wanted at once. As the size specified is not stocked, the nearest size (larger) in stock is issued, but is returned from the machining department because the planner insists upon the correct material being used. More valuable time is wasted here, apart from the probable wastage of material, and the suggestion of advance instructions being sent to the store should be seriously considered.

Even if these safeguards are adopted, however, it does not mean that delay will be altogether obviated in connection with the issue of material supplies, although it should be considerably curtailed. Often the delay is extended because there is no intelligent procedure operating in the material store to ensure orders being promptly met when the material is received, whilst, in addition, the absence of such a procedure means that the buyer does not get information relating to the urgency of one specific class of material. The material storekeeper should at all times know exactly what orders are held up pending receipt of further supplies, so that he can give proper information to the buyer, and issue the material immediately it is received. The following procedure, put into operation by one firm of engineers, gave satisfactory results in this respect :—

All material demands were made known by means of a requisition form (fig. 1), made out in triplicate, two copies being sent to the store, and one retained by the foreman. In the event of the material being in stock, it was at once issued, one copy of the requisition being returned to the foreman (with the material) and the other (after signature for receipt was appended) retained in the store for posting to the stock card.

Fig. 2.—Guide Card.

If the material was not in stock, one copy of the requisition was at once returned to the foreman, endorsed "No Stock," while the other, similarly endorsed, was retained in the store, being placed behind a guide card (fig. 2) bearing the appropriate job number. Before this was done, however, a small card was made out and pinned to a board headed "Jobs awaiting material" (fig. 3), blue cards representing castings and stampings, and white cards bar and sheet materials, &c. In connection with the cards for castings and stampings, the part number or pattern number had to be given, while the cards for other materials had to give the size and

particulars of material, in addition to the part number for which the material was required.

The storekeeper ascertained from his stock card that sufficient supplies were on order to meet the demand, and twice weekly he sent to the buyer a list of all orders awaiting supplies, together with particulars of the material required. This had the effect of keeping the buyer posted with the urgency of any specific material, and influenced his actions in the matter of obtaining supplies.

It was not intended, however, that the storekeeper should confine his attention strictly to orders actually held up, for with the best intentions he could do no more than minimise delay that had already occurred.

JOBS AWAITING MATERIAL

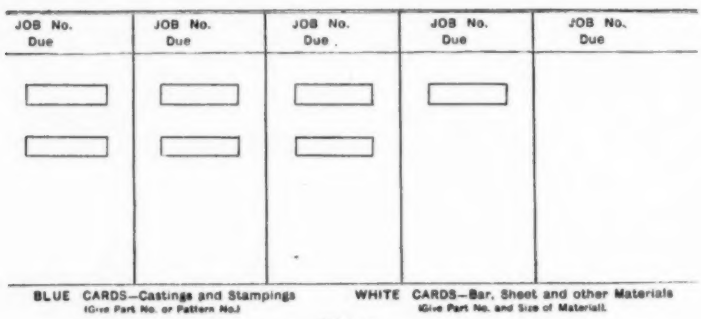

JOB No. Due
JOB No. Due
JOB No. Due
JOB No. Due
JOB No. Due
BLUE CARDS—Castings and Stampings (Give Part No. or Pattern No.)
WHITE CARDS—Bar, Sheet and other Materials (Give Part No. and Size of Material)

Fig. 3.

It was his business to maintain adequate supplies of material, and thus obviate delay, and he was assisted in this direction by the material shortage board (fig. 4). This board was arranged for classified materials, and under the various classifications appeared the materials, the stocks of which had reached the danger point, this information being derived from the stock card.

For example, the stock card for a specific material might give the maximum as 1,500 lb.; the ordering point as 750 lb.; and the danger point as 350 lb. Immediately the latter figure was reached, particulars were entered upon a small card, which was then pinned to the board under the correct classification, even though no jobs were held up for the material. A list of materials appearing upon this board was also sent to the buyer twice weekly, and many delays were obviated by prompt action on the part of the buyer, following information received from the material store.

It is undoubtedly true that in many works sufficient attention is not given to the material store by the management, and yet it should be apparent to all that any delay here is reflected throughout the whole course of manufacture. It may be contended that sufficient has been done by fixing the stocks to be held, and that it is the duty of the storekeeper to maintain a sufficiency of such stocks. In the modern works, however, the different phases of organisation are interdependent, and no one department can work quite independently. The storekeeper is influenced by circumstances quite outside his control, and the least that can be done is to give him the facilities which will enable him to make known to interested parties adverse circumstances, and also do his own work in the most expeditious manner possible. The method outlined in this article achieves these results.

Standardisation in Czecho-Slovakia.—The Czecho-Slovakian Government has recently adopted a number of standards for electrical work based on those in force in Great Britain, Germany, America, and France.

Legal.

Beet-Sugar Company Prosecuted.

THE Nottingham magistrates, on January 30th, gave their decision in the case reported in our last issue (p. 211) in which the Anglo-Scottish Beet Sugar Corporation, Ltd., was prosecuted for failing to efficiently protect a brass collar conductor forming part of a screw-cap lamp, in consequence of which an employé was killed. During the original hearing the company claimed that the premises in question were not a "factory" within the meaning of the Act.

According to the *Nottingham Evening Post* the magistrates' decision was to the following effect:—"We are of opinion that the defendant company is guilty of the offence charged, and upon the summons in respect of neglecting to observe regulation 2, in consequence of which the workman John Albert Glover was killed, the company is fined £50."

Mr. Saywell asked that costs of 25 guineas should be allowed, but the magistrates allowed five guineas to come out of the fine.

A Dublin Electrical Dispute.

IN the Dublin Circuit Court, before Judge Pigot, last week, Mr. P. J. Lawlor, electrical contractor, of Dublin, sued the New Ireland Assurance Society, Dublin, for £30, for work done in connection with the electrical installation at the Society's new premises.

Mr. Lawlor gave evidence as to his securing of the contract. When he had the work completed £35 was deducted under a clause in the specification, which stated "providing a sum of £5 for points in the schedule marked F." He contended that the proper construction of this clause was that £5 only should be deducted for all seven points. For the Assurance Society it was contended that the clause meant that £5 should be deducted for each of the seven points.

Judge PIGOT held with the plaintiff, and gave him a decree for the £30 claimed.

Mullard Radio Valve Co., Ltd., and Ballantyne v. Hay and Son.

THIS action was mentioned before Mr. Justice Russell, in the Chancery Division, on February 5th, when Counsel for plaintiffs moved for an injunction to restrain infringement of two letters patent with respect to valves. Counsel stated that the defendants, who appeared in person, had consented to treat the motion as the trial of the action and to pay an agreed sum for costs. There would be no inquiry as to damages, defendants having disclosed the names of their suppliers. They were willing to submit to a perpetual injunction.

His LORDSHIP made an order accordingly.

MATERIAL SHORTAGE

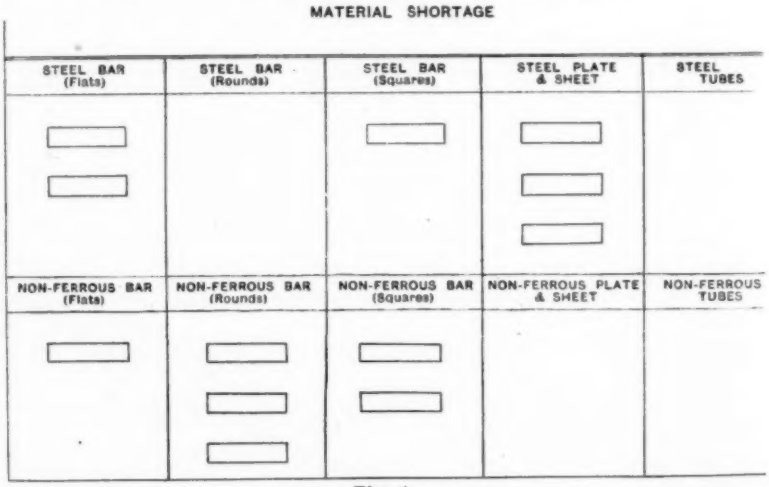


Fig. 4.

British Thomson-Houston Co., Ltd., v. London Electric Lamp Co.

IN the Chancery Division, before Mr. Justice Russell, on February 5th, Counsel appearing for plaintiffs in this action moved for an injunction to restrain infringement of two letters patent. He stated that there was an *ex parte* injunction running over that day. Defendants were now willing to treat the motion as the trial of the action and to submit to an injunction. They would pay the costs, but there would be no inquiry as to damages, defendants having disclosed their suppliers. The plaintiffs waived any claim for damages.

His LORDSHIP made an order accordingly.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Illumination at Blackpool Jubilee Celebrations.—At a recent meeting of Blackpool Jubilee Celebrations Committee, it was reported that Mr. C. Furness, electrical engineer, had considered the question of illuminations, and was of the opinion that it would involve a minimum cost of £8,500. It was proposed to have the greater part of the promenade illuminated, which would require nearly 200,000 lamps. The engineer suggested that the Committee should offer £250 to be distributed in prizes for the best illuminated features carried out by companies or ratepayers. It was proposed to charge 2d. per kWh for electricity for private schemes of illumination.

An Industrial Lighting Chart.—The dimensions of the chart issued by the BENJAMIN ELECTRIC, LTD., were given incorrectly in our last issue. It is 30 in. long and 20 in. wide.

An Inquiry from India.—An Indian firm (Bombay) desires to be put in touch with high class manufacturers of electrical apparatus of the types described below. Concerns already fully represented in India should not apply:—

(1) Switch and fuse gear, comprising fuses 15 to 200 amps., with back connections and terminals; cartridge fuses and aerial fuses. Knife switches 25 to 200 amps., unmounted, but complete with terminals. Ironclad switch and fuse boxes (D.P. and T.P.), 10 to 200 amps.

(2) Insulating materials, comprising ebonite and fibre sheets and rods, cotton tape and Empire tape and cloth.

(3) Poles for overhead transmission purposes.

(4) General electrical machinery.

All communications relating to these items should be addressed in the first instance to the ELECTRICAL REVIEW Service Department, 4, Ludgate Hill, London, E.C.4.

Our Productive Capacity.—In the course of his recent speech to the shareholders of the Midland Bank, Ltd., the chairman, Mr. R. McKenna, traced the causes of Great Britain's industrial depression. He said that this was generally attributed to one or more of the following causes: first, that much of our plant in the heavy industries was out of date and our organisation defective; secondly, that there was a superabundance in the world's supply of those commodities which we usually exported; thirdly, that wage costs were too high, more particularly in some of the sheltered industries; next, that the burden of taxation, both national and local, threw a charge upon industry which handicapped us in competition for foreign markets; and finally, that the unsettlement of Europe had gravely restricted the purchasing power of many of our customers. While these were all serious obstructions to trade, the policy of deflation had also contributed largely, but there was good reason to believe that eventually we should reap the reward due to this policy. Mr. McKenna said:—"It is not unusual for writers on the present day conditions of England to discover signs that the productive capacity of our country in competition with other nations has passed its zenith. I confess, however, that I do not share their opinion. There is always room for improvement, and I believe the years of depression have been a testing time for us and a warning to put our house in order. The exceptional depression has been largely due to temporary financial conditions, and I have strong hopes that these are now coming to an end."

A Co-operative Society's Electrical Department.—The Blackpool Co-operative Society recently opened a department for the sale and installation of electrical appliances and reports successful trading for the first half-year. The sales, direct and through other departments, amounted to £1,242 and work valued at £588 was done for members. The result was a net profit of £103.

Unemployment.—There was a decrease of 15,075 in the number of unemployed registered at the Employment Exchanges during the week ended January 25th. The total at that date was 1,200,800, as compared with about 1,241,000 twelve months earlier.

German Failures.—Official figures just published concerning the number of bankruptcies and applications for "Official supervision" (equivalent to moratorium) show that January eclipsed all previous records. There were 2,092 bankruptcies and 1,553 supervisions granted, as against 660 bankruptcies and 1,388 supervisions in December. Bankruptcies were therefore three times those of the worst previous month. Though these bankruptcies were distributed throughout all industries textile and motor branches suffered more than any other.—*Financial Times.*

Capturing Foreign Markets.—In a speech at Woking last week Mr. A. M. Samuel, Parliamentary Secretary of the Department of Overseas Trade, said that British manufacturers should endeavour to produce more decorative and up-to-date goods for foreign markets. According to the *Financial News* Mr. Samuel made special reference to telephone and radio apparatus. "We accepted," he said, "the vulcanite telephone receiver, but no one ever attempted to enclose it in a box or case to keep the instrument clean." Our equipment was second to none for wireless sets and in a few years' time every house, if not every room in a house, would possess a set.

Electric Meters for Japan.—The demand for electric meters in Japan has in recent years reached large proportions; in 1924 no fewer than 400,000 were bought. The bulk of these were of German manufacture, although appreciable quantities were supplied by the United States, Great Britain and Switzerland. Japanese manufacturers find it impossible to compete with foreigners on the score of low prices, and they propose to ask the Government to raise the import duty upon these meters.

Callender's Hospital Fund.—We have received a copy of the 23rd annual report of the Hospital and Distress Fund of Callender's Cable and Construction Co., Ltd. The receipts during 1925 amounted to £1,550 (including £95 brought forward) and the expenditure to £1,468, leaving a balance of £82 in hand. Apart from rendering aid to over 360 members, the fund made grants aggregating £934 to sixteen institutions.

The Basle Water-Power Exhibition.—It is announced that a number of the leading European countries are officially participating in the International Exhibition of Inland Navigation and the Utilisation of Hydraulic Power which is to be held at Basle from July 1st to September 12th this year. Negotiations are also proceeding with the Governments of Great Britain, Canada and other countries.

The Reorganisation of the Supply Industry.—Mr. Samuel Ferguson, managing director of Messrs. Ferguson, Pailin, Ltd., said at the company's recent annual meeting that the reorganisation of the electricity supply industry would take 15 years to complete. The London area was in such a deplorable state electrically that even if the whole of the industry's efforts were applied to its reorganisation, the task would take five years.

World Employment.—The issue of *British Industries*, dated January 30th, contains a series of curves showing the trend of employment in the eight leading industrial countries during 1923, 1924, and 1925. The United States curve shows a large decline of employment in 1924 with a partial recovery in the succeeding year. The French and Belgian curves are practically level. The trend in Italy has been upward but there have been two or three sharp lapses. The Canadian curve, while horizontal in character, has also experienced some fairly large fluctuations. There was a very serious fall of employment in Germany at the end of 1923, but since that the general tendency has been improvement and 1925 closed with employment at about the same level as at the beginning of 1923. The United Kingdom curve is flat but with a decided improvement in 1924, and a return to the 1923 level last year. Swedish employment has encountered violent fluctuations; the curve appears to be of a seasonal character—high in summer and low in winter.

Australian Customs Tariffs.—Owing to the Australian manufacturers not being in a position to meet the requirements of Australian users, the Department of Trade and Customs has deferred until April 1st the operation of duties which were to have come into operation on January 1st, 1926, upon valves for radio-telegraphy and telephony.—*Reuter's Trade Service* (Melbourne).

International Customs Tariffs.—Writing in the "Review of 1925" issue of the *Manchester Guardian Commercial*, Prof. Gilbert Cannan says:—"It is quite impossible to believe that the present barriers against the free movement of persons and goods will be long maintained by the two dozen States between which Western Europe is now divided. A perception of common interest must soon lead to Customs unions being concluded here and there, and when the movement is once begun it will be difficult to stop, as the largest combination will offer great attractions to other units. . . Hence we should not dismiss as altogether Utopian the talk of a European, or at all events a Western European, Continental Customs Union or Zollverein, which was heard of last year in the most unlikely quarters. Sooner or later, unless the whole system of Customs duties is first abandoned, such a consummation will come about. Great Britain will then have the choice of joining the Continent or becoming a perfectly free port. It is scarcely conceivable that she could stand aside with a protection system of her own."

A Siemens-G.E.C. Combination.—It is announced that arrangements have been made to merge the railway signalling departments of Messrs. Siemens Bros. & Co., Ltd., and the General Electric Co., Ltd., under the title of "Siemens and General Electric Railway Signal Co., Ltd."

Trade Announcements.—MR. F. J. GORDON, manufacturers' representative, has moved to larger premises at 92, Charlotte Street, W.1, including a showroom and stores.

MESSRS. W. WORBY BEAUMONT & L. W. BURT have removed their offices to 20, Essex Street, Strand, W.C.2. Their telephone number and telegraphic address are unaltered.

MR. H. H. CASSE has resigned his directorship of Charles Bell, Ltd., and has commenced business in partnership with Mr. N. Walker at St. Jude's Place, Manningham Lane, Bradford.

MESSRS. JAMES GORDON & CO., LTD., inform us that Mr. J. J. Lasson has retired from the board of directors, and has no further interest in or connection with the company.

MR. JOHN HARRIS, of 113-117, Caversham Road, Reading, has opened an electrical service station in connection with his business.

MESSRS. T. W. BROADBENT, LTD., of Victoria Electrical Works, Huddersfield, have arranged with Messrs. Darroch and Espie, of Dock Works, 37, Weir Street, Paisley Road, Glasgow, to act as their representatives in Scotland for the sale of a.c. and d.c. generators and motors, as successors to Mr. James Espie of the same address, who is retiring from business.

MISS E. STRINGER informs us that she has resigned her position as London manager for the Concordia Electric Wire Co., Ltd., having been appointed sole selling agent for F. & E. Stanton, Ltd. She is opening a sales office at 3, Victoria Street, S.W.1. (Telephone: Victoria 1485.)

THE SAXONIA ELECTRICAL WIRE CO., LTD., has taken over the stocks of insulated copper and resistance wires of the Engineering Supplies, Ltd., and is supplying these instrument wires in addition to the flexible cords, &c., which they manufacture.

Catalogues and Lists.—SIEMENS AND ENGLISH ELECTRIC LAMP CO., LTD., 38 & 39, Upper Thames Street, E.C.4.—February price sheet of electrical materials and appliances. Fully illustrated.

HIGGS MOTORS, Witton, Birmingham.—A price list of industrial electric motors (a.c. and d.c.), d.c. generators, and motor-generator sets.

THE EAST LONDON RUBBER CO., 29, Great Eastern Street, E.C.2.—A set of illustrated and priced sheets adding to and revising the firm's comprehensive radio apparatus catalogue.

MESSRS. YOUNG & WILDSMITH, 20, Bloomsbury Street, W.C.1.—A trade price list of electrical materials and accessories.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Catalogue Section SF, illustrating and describing various types of signs and flashers produced by the company, fully priced; and a mailing card advertising "Pirelli-General" flexible cords with cotton and silk coverings of various colours.

MESSRS. L. MCMICHAEL, LTD., Wexham Road, Slough, Bucks.—Pamphlets dealing with h.f. radio transformers and their use, "Dimic" air-spaced coils, condensers, grid leaks, &c. Illustrated and priced.

CRANE PACKING, LTD., Slough, Bucks.—A brochure dealing with the use of metallic packing in various spheres; also two illustrated pamphlets treating of the same subject.

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2.—A leaflet advertising the company's electric lamp service.

K.F.M. ENGINEERING CO., LTD., 29-31, Portugal Street, Kingsway, W.C.2.—A well-illustrated catalogue of "Internalite" day and night signs.

MESSRS. FERRANTI, LTD., Hollinwood, Lancashire.—Illustrated pamphlets dealing with the company's l.f. transformers, including amplification curves over the musical scale. Also a showcard advertising this component.

MESSRS. GEORGE GREEN & CO., 40, Aybrook Street, W.1.—Leaflet No. M.214, bearing an illustration and prices of "Gee-Gee" electric tea urns.

Bankruptcy Proceedings.—H. L. WOOD, 7, Taswell Road, Southsea, Hants, electrical engineer and radio dealer.—The public examination of this debtor was held on February 1st, at the Court House, Portsmouth. The statement of affairs showed liabilities of £4,069, against assets of £85, leaving a deficiency of £3,984. Debtor attributed his failure to judgment and costs of an action brought against him by his late partner amounting to £1,917. He commenced business as an electrical engineer in 1918, at High Street, Clapham, with about £500 capital. The business appeared to have been a success, and in August, 1920, was sold for £1,500. He came to Portsmouth and started a new business, and in March, 1921, he was joined in partnership by another, who paid £2,000 for a half share in the business. The partnership bought an additional business and traded as electrical engineers, later dealing in radio sets. The business was not successful, and in May, 1923, a deed of dissolution was executed and the business wound up. As a result a claim was made against the debtor. He then entered into partnership with his wife, and on November 17th last the business was converted into a company and he and his wife were directors. The consideration for the sale was £1,998, which was satisfied by the allotment and issue to the vendors of 498 ordinary shares and by the issue of £1,500 debenture stock to debtor's wife. The examination was adjourned.

G. W. H. HANFORD (Radio Manufacturing Co. and the O.I.C. Manufacturing Co.), 37, Gold Street, Southsea.—Trustee, Mr. C. Hoult, 87, High Street, Portsmouth, released January 27th.

W. G. BAYMAN, electrical engineer, late of 13, Russell Street, Plymouth, now of 86, North Side, Wandsworth Common, S.W.—Last day for proofs for dividend February 17th. Trustee, Mr. T. Gourlay, 29, Russell Square, W.C. Discharge suspended for one year, until January 11th, 1927.

P. BOSWELL (Boswell & Co.), electrical engineer, 132, Earl's Court Road, S.W., and 110, Ebury Street, S.W.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., released August 26th.

R. E. HUGHES and R. MCL. ALEXANDER (R. E. Hughes and Hughes and Alexander), house furnishers and electrical and wireless engineers, 129, Brockley Rise, S.E., and 51, Honor Oak Park, S.E.—Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., released October 1st.

M. KELLY, radio apparatus dealer, 12, Jackson's Row, Manchester.—Receiving order made February 3rd, on creditor's petition.

Company Liquidations.—ANTILL, LTD., Seymour Place, Marble Arch, W., electrical engineers, &c.—A meeting of creditors was held on February 6th, at the Institute of Chartered Accountants, E.C. Mr. C. Pittman, C.A., the liquidator of the company, submitted a statement which disclosed liabilities of £7,593 and net assets of £1,258, leaving a deficiency as regarded the unsecured creditors of £6,335. It was reported that Mr. R. A. C. Antill commenced trading in 1914. He joined the Army during the war, disposing of his business. On his demobilisation in 1919 he again started trading, and the present company was formed and took over the concern, in 1920. The issued capital of the company was £8,625. Between May and December, 1920, there was a net loss on the trading of £442, and in 1921 there was a net loss of £1,643. In the succeeding 12 months there was a net loss of £975, and in 1923 the net loss rose to £1,973. During 1924 a net profit of £490 was earned, but since that time further losses had been sustained aggregating £3,437. The company's turnover ranged from £20,000 to £33,000 per annum, and it was stated that losses had been incurred on contracts. Some little time ago creditors were approached and asked to stay their hands, it being hoped that arrangements could be made for the payment of all the liabilities in full. Creditors, however, began to press, and liquidation then took place. A resolution was passed confirming the voluntary liquidation of the company, with Mr. Pittman and Mr. A. E. Quaife, of Messrs. Westacott, Quaife & Co., of High Holborn, as joint liquidators.

PRESSLAND ELECTRIC SUPPLIES, LTD.—Winding up voluntarily. Liquidator, Mr. W. Bronson, 157, Cricklade Avenue, Streatham Hill, S.W.2. A meeting of creditors is called for February 17th at the Sun Hotel, Kingston-on-Thames.

Dissolutions of Partnership.—MAY & JENNINGS, gas, oil, electrical and mechanical engineers, 203, Kirkstall Road, Leeds.—Mr. A. C. May and Mr. W. A. Jennings have dissolved partnership. Mr. May will attend to debts.

ERNEST WESTON & CO., motor and wireless engineers, &c., London Road, Crowborough.—Messrs. E. Weston and L. J. Dumble have dissolved partnership.

Meeting of Creditors.—COLE, MARCHENT & MORLEY, LTD.—An informal meeting of creditors will be held at Prospect Works, Wakefield Road, Bradford, on February 16th, when a statement of affairs prepared by the company's accountants will be presented to the meeting.

The Portuguese Electrical Market.—In a recent article upon this subject, *Commerce Reports* says that the relative cheapness of domestic labour and the high price of electrical energy in Portugal, discourage the sale and use of domestic electrical appliances. Germany satisfies the greater part of the limited demand for electric fans, offering them at low prices and giving liberal credit. The same applies to vacuum cleaners. The above-mentioned high charges for electricity preclude electric cooking, although there is a demand among the wealthier classes for small water heaters, toasters, hotplates and percolators. Both cookers and heaters would probably become popular if the charges were reduced. Electric washing machines are practically unknown. Refrigerators are used to some extent, the large hotels employing German makes. A firm securing the general agency of a manufacturer always desires the whole of Portugal as its territory and this is usually satisfactory when the concern has connections in Lisbon. Electrical appliances are sold on a strictly cash basis, but it is considered that there is scope for the introduction of a rental system by private interests.

Railway Electrification in Venezuela.—Mr. J. A. Goudge, C.B.E., chairman of the La Guaira and Caracas Railway, speaking at the company's recent annual meeting, is reported by the *Financial Times* to have said:—"We have seen the results of several schemes of electrification of railways in South America and elsewhere, which, frankly, have not increased the profit of the undertakings which have constructed the electrification. But if you ask us to-day whether we would face the responsibility of going on as we are or spending the money which we propose to spend in electrification, we unhesitatingly say we will electrify."

The Traders' Co-ordinating Committee.—This committee, which was formed five years ago by the Federation of British Industries, the Association of British Chambers of Commerce, and other organisations, to co-operate in the presentation of the traders' case before the Railway Rates Tribunal, is appealing for funds to enable it to continue the work which it has been carrying out successfully. It is claimed that the Committee has already saved the traders of the country £3,000,000 a year which would otherwise have gone to the railway companies, and an unratified agreement has been made whereby a saving of a further £3,000,000 will be effected. The offices of the Committee are at 39, St. James's Street, S.W.1.

New Australian Companies.—Williams & Shaw Pty., Ltd., is the name of a company recently formed in Melbourne with a capital of £20,000 to carry on business as electrical engineers, indentors and importers.

With a capital of £20,000, the Victor Storage Batteries Pty., Ltd., has been formed in Melbourne to engage in the manufacture of electric storage batteries, &c.

The 44-hour Week in Australia.—The Forty-Four Hour Act came into force in New South Wales on January 4th. It provides that while no more than 44 hours shall be worked in any week the hourly rates shall be increased to bring wages to the same figure as prevailed under the 48-hour week arrangement.

South American Markets.—Two recent Department of Overseas Trade publications (obtainable from the Stationery Office) deal with markets in the South American region. The first is a report on Ecuador (1s. net) by the Acting Chargé d'Affaires at Quito, Mr. W. C. Graham. It is stated that a peaceful *coup d'état* occurred in July, 1925, and a provisional government was formed. The latter's programme includes the unification of the complicated Customs duties and the revision of all municipal and public contracts. There is said to be a growing market for industrial and agricultural machinery; German and American manufacturers have established machinery stocks, which place them in a favourable position. The imports of machinery and apparatus during 1924 showed a decrease in weight from 3,277,566 kg. to 3,251,252 kg., but the value rose from £186,654 to £236,823. British traders are advised to draw up all their catalogues in Spanish and to be very careful in their choice of representatives in this market. Cases are not uncommon of British manufacturers appointing agents who also represent foreign houses dealing in a similar line of business. Appointments should not confer representation for the whole of the west coast of South America—a region far too wide for one agent to cover.

The second report deals with the Dominican Republic and Hayti (1s. 6d. net). The part relating to the former State, by Mr. J. Bowering, British Consul and Chargé d'Affaires at Santo Domingo City, states that the imports of electrical machinery, apparatus, and appliances during 1924 were valued at $118,270, the United States' share being 96.5 per cent. In 1923 the value was $117,072. The report says that the demand is principally for low-grade or second-quality goods as the purchasing power of the population is limited. Quotations should be c.i.f. Dominican ports and in American dollars. Mr. E. D. Watt, Acting Consul at Port-au-Prince, says that although Hayti is supposed to be rich in mineral resources no attempt has been made to develop them, which leads to the belief that either the quality or the quantity does not justify development. The British share of the import trade increased during the year 1924-25 and, given competitive prices, there is no reason why it should not continue to expand. The imports of machinery and apparatus during the period October 1st, 1924, to August 31st, 1925, were valued at $480,332.

British Railway Material for New Zealand.—The Premier of New Zealand announced last week that the Government would shortly invite tenders for the supply of railway material valued at £300,000 as the first instalment of the £800,000 extension scheme which is to be carried out during the next three years. It is to be stipulated that only material produced in the British Empire shall be used.

New Municipal Showrooms.—The Mayor of Lincoln (Miss M. E. Nevile) formally declared open the new showrooms of the Lincoln Electricity Department, in Corporation Street, on February 1st. A large number of officials were present, including the city electrical engineer (Mr. Stanley Clegg), the chairman of the electricity committee (Ald. W. S. White), the electrical engineer of Grimsby (Lt.-Col. Vignoles), and the vice-chairman of the Grimsby Electricity Committee (Councillor C. Fletcher). Ald. W. S. White, in the course of a speech, said that it was now realised that it paid to advertise just as much when selling electricity as any other commodity. The Lincoln Corporation electricity undertaking was inaugurated in November, 1898. In 1899 an exhibition was held, but though no doubt this gave a start to the department, the progress made for some years was very slow. Two years ago a second exhibition was held, and it could be truly said that the business of the department had expanded since that date in a manner never previously known. The appeal of that exhibition was made particularly to the householders in the city, and it was in the use of electricity in the home that great strides had been made.

Malay Hydro-Electric Scheme.—In a recent interview with the *Financial News*, Sir Montague Barlow gave some particulars of the Perak River hydro-electric scheme for which Sir W. G. Armstrong, Whitworth & Co., Ltd., have received a concession from the F.M.S. Government. It is proposed to form a public company to operate the concession. A dam and two sluices will be constructed in the river to give a gross head of 59 ft. There will be two 9,000-kW generators with provision for a third, and a steam stand-by plant with a capacity of 5,000 kW will also be provided. The bulk of the power will be supplied to the tin mines in the Kinta Valley and a number of electrically-operated dredges are being made to utilise it. The agreement (which is backed by the Government under the Trade Facilities Acts) requires that all machinery, &c., shall be of British manufacture, and the company will place orders for well over a million pounds' worth of work with British firms.

Social Event.—The annual dinner and general meeting of the A.T.M. Golf Club (Automatic Telephone Mfg. Co., Ltd.), were held at the Bear's Paw Restaurant, Liverpool, on January 30th. After dinner Mr. G. W. Moore (manager) presented trophies and medals to the successful members, Mr. C. H. Archer securing the "Tay-Mel" cup (presented by Messrs. E. Taylor and E. A. Mellinger, directors of the company). Mr. J. J. Langley was elected captain for the forthcoming season, Mr. W. A. Philips secretary, and Mr. G. C. Hague treasurer.

German Loans in America.—The *Financial Times* states that a group of towns in the Palatinate have taken up a loan of $3,800,000 at 7 per cent. against joint security from a consortium of American banks. The loan is for 20 years and will be used for the development of the municipal gas, water, and electricity works. The Berlin municipality is also seeking a short-term loan of $3,000,000, at 6½ per cent. from one of the leading New York banks. This is required to finance the completion of the big power station at Rummelsburg.

Municipal Trading at Burnley.—The Burnley Corporation has discussed with the British Electrical and Allied Manufacturers' Association the question of the terms upon which the electricity department proposes to sell domestic and other apparatus to the public, as well as the terms of hire purchase. As a result of the conversation, all existing resolutions concerning the sale or hire of electrical appliances are to be rescinded and fresh regulations drafted. Cash sales are to be at the list prices issued by the manufacturers. Thus, a difficult question affecting the interests of local electrical contractors has been amicably arranged.

The electrical exhibition organised by Burnley Corporation was brought to a close on February 6th. It has been extraordinarily well supported, and is described as one of the most successful events in the Provinces. Domestic apparatus has been freely sold, and the Department have had some difficulty in coping with the rush. The Corporation is making a feature of wiring people's houses on the deferred payment system, a four-roomed dwelling being done for £12, of which sum 36s. is the immediate deposit, leaving the balance to be paid at 12s. 9d. per quarter.

Irish Free State Electrical Imports.—The appended table shows the value of the total imports of electrical machinery and apparatus into the Irish Free State during the first nine months of the two past years, and the amount attributed to the United Kingdom as country of shipment but not necessarily of manufacture:—

	Total. Jan. to Sept.		U.K. share. Jan. to Sept.	
	1925.	1924.	1925.	1924.
	£	£	£	£
Electric wires and cables	81,737	52,032	68,757	39,618
Telegraph and telephone instruments and apparatus	21,279	24,018	21,074	23,893
Electric lamps and parts	38,440	36,237	37,931	34,333
Batteries and accumulators	22,063	17,111	20,666	16,254
Radio sets and parts ...	34,964	78,615	34,023	76,997
Other electrical goods and apparatus	50,549	78,830	48,117	75,496
Electric generators ...	10,660	6,864	10,147	6 726
Electric motors	18,853	12,760	18,316	12.175
Other electrical machinery	51,887	31,838	45,719	31,020
Totals	£330,432	£338,305	£304,750	£316,512

It will be seen that while wide variations are shown in the different classes of goods, the 1925 imports show a drop of £7,873, as compared with those of the preceding year. All but £25,682 of the goods came from the United Kingdom, and of the balance £8,999 is attributed to Belgium, £7,867 to Germany, and £8,999 to "other countries."

The Swiss Electrical Engineering Industry.—A Swiss contemporary, commenting on the electrical engineering industry in Switzerland during the past year, states that while during the first six months an increased output was recorded, new orders were difficult to obtain during the second half of 1925 owing to the keenness of international competition. Moreover, as orders for new material for the Swiss Federal Railways have decreased, the outlook is not regarded as very bright. The recent fall in the value of the French franc is also regarded as detrimental to the Swiss electrical industry.

Strike at Padiham Station.—A strike has occurred among the steel constructional engineers of one of the contracting firms at the Lancashire Electric Power Co.'s station at Padiham. The men receive 1s. per hour for their labour, and are claiming 1s. 5½d. per hour, which, they allege, is the minimum for constructional work.

Swiss Industries Fair.—CORRECTION.—We regret that the date of this Fair, which is to be held at Basle, was given incorrectly in our issue of January 29th. It is to run from April 17th to 27th.

German Aid for Russia.—According to a statement published by a Berlin newspaper, the Soviet State Electrical Trust has entered into an agreement with the A.E.G. for a period of five years to secure technical assistance for the Russian works for improving the production. The trust is given the right to utilise the German company's patents, will be supplied with patterns, and will have the right of having engineers trained at all works of the German company.

"Electrical Freedom."—This is the title of a booklet which has been produced by the Electrical Contractors' Association (Inc.). It is described as a brief statement of the claims of electrical installation contractors and electrical retailers, and it is mainly directed against State and municipal electrical trading and contracting. It is contended that while electricity supply should be carried on under public control, as water supply generally is, municipalities should not engage in the wiring of premises and the sale of electrical appliances.

An Austrian Electrical Syndicate.—It is announced from Vienna that the four large manufacturing companies—the A.E.G.-Union, the Siemens-Schuckert Co., Brown, Boveri and Co., and the Elin—recently formed themselves into a syndicate for the purpose of fixing prices and conditions of delivery on a common and uniform basis, particularly in the case of contracts open to public competition. The constitution of the syndicate is now said to have evoked opposition in various quarters. Thus the city of Vienna states that in order to cope with the situation it will obtain its requirements from abroad in future, while a similar decision is credited to the Austrian Federal Railway authorities.

Threatened "Underground" Electricians' Strike.—We reported recently that members of the Electrical Trades Union employed in London electricity undertakings had been awarded an increase of 6½ per cent. in their wages. The "Underground" railway companies have declined to apply this award to the men employed in their power stations, and in consequence the Union has decided to take a ballot upon the question of a strike among its members employed in railway power stations; the papers are returnable by February 20th. About 1,000 men are involved. The railway companies contend that they are not so favourably placed as the supply authorities in their ability to pay the increase. The Minister of Labour is said to be "watching" the situation.

Book Notices.—"Faraday House Journal." Vol. XI, No. 5; Lent Term, 1926.—Mr. L. J. Kettle, electrical engineer and manager of the Dublin, Irish Free State, electricity undertaking, is the subject of the frontispiece. He is president of the F.H. Old Students' Association. Mr. E. C. I. Macdonald deals with Brazilian railway electrification, Mr. S. Gibson writes on asbestos, and Mr. W. A. Benger describes the Parkinson "Tork" single-phase motor.

"Science Abstracts." A & B. Vol XXIX. Part 1, No. 337, and Index 10, Vol. XXVIII (A & B). London: E. & F. N. Spon, Ltd. Price 3s. each.

"Pyrometers," by E. Griffiths. Pp. xi + 126; figs. 49. London: Sir Isaac Pitman & Sons, Ltd. Price 7s. 6d. net.

"The *Journal* of the South African Institution of Engineers." Vol. XXIV, No. 6. January, 1926. Price 2s.

"The *Electrician* Electrical Trades Directory and Handbook for 1926." London: Benn Bros., Ltd. Price 25s. net.

United States Electrical Exports.—According to *Commerce Reports*, the preliminary figures of exports of electrical goods from the United States during the first eleven months of last year show a total value of $80,264,527, which is only $1,800,000 below the total for the whole of 1924. It is estimated that the figure for the full year will be about $85,000,000. This is not a complete figure, however, for a great deal of electrical apparatus is incorporated in other exports, *e.g.*, automobiles, washing machines, refrigerators, &c. Generally speaking, more business was done in smaller equipment during 1925, and less in heavy equipment. This is attributed to some extent to the increasing representation of the smaller American firms in foreign markets. There were increases in a.c. generators, steam generating sets, and self-contained lighting sets, but the shipments of d.c. generators and motors were smaller. Small motors showed a substantial gain, but stationary and railway motors declined. There was a large fall in the exports of electric locomotives, but the shipments of batteries were heavy, owing to the interest in radio-telephony. The exports of telephone and telegraph apparatus remained at about the same level, but those of domestic appliances continued their rapid progress. Wiring devices, electric lamps, and ignition equipment exports all showed rises, but the greatest increase occurred in the radio apparatus section, which increased by about $4,000,000 to $8,936,565 in the first eleven months of 1925. It is estimated that radio exports constituted 11 or 12 per cent. of the whole of the United States foreign electrical trade during 1924.

As regards distribution, it is said that exports to Europe were slightly smaller, but Great Britain remained the principal customer. Exports to Australia and New Zealand and South America increased.

For Sale.—Birmingham Corporation Electric Supply Department has for disposal three d.c. and one a.c. generating sets. Messrs. Fuller, Horsey, Sons & Cassell will sell by auction on March 2nd and following days, at the Cubitt Engineering Works, Aylesbury, the entire contents of the works, including engineers' machine tools, motor-body building plant, electric power plant, &c. (See our advertisement pages to-day.)

An Arc-Welding Plant Contract.—Among the orders secured by members of the F.B.I. recently was one for three two-operator arc welding machines for the Eastern Bengal Railway, supplied by Alloy Welding Processes, Ltd.

The London Engineering Dispute.—Negotiations between the engineering employers and employés in the London district regarding the application for a 2os. per week increase remained suspended last week on account of an unofficial strike at a printing-press manufacturer's works. A meeting between the national executive of the Amalgamated Engineering Union and the London District Committee of the union was held on Saturday last to discuss the dispute.

Electric Locomotive Manufacture in Japan.—In August last an order was placed by the Nippon Denryoku K.K. for four 25-ton electric locomotives with the Kawasaki shipbuilding yards. Although the works had had no previous experience of the work, two of the locomotives were completed in four and a-half months. It is claimed that the materials used are wholly Japanese, there being no foreign work in them whatever. The yards are said to have orders for 12 more locomotives for various railway authorities.

An Anglo-Greek Electricity Scheme.—The Athens correspondent of the *Financial News* reports that under the contract signed in September last between the Greek Government and an Anglo-Hellenic group (including the Power and Traction Finance Co., Ltd.), the latter has received a 60-year concession. This gives the group the exclusive right of the production and distribution of electricity within a radius of 20 km. from the centre of Athens, and the exclusive right to install and operate tramways in this area; the right to supply electric current to bodies outside this area; and the exclusive right of the exploitation of the Athens-Kefissia Railway. The initial capital of the group will be about £4,000,000, half of which will be raised in London under the Trade Facilities Acts.

American Sales in England.—The sale of high-grade radio parts of American manufacture has increased considerably in England, and there is a growing desire among British electrical dealers to become agents for American radio manufacturers. This demand is also being felt in the household appliance line.—*Commerce Reports.*

Copper, Lead and Rubber Prices.—Messrs. F. Smith and Co. report February 9th:—Copper (electrolytic) bars, £67, 30s. increase; do. do. sheets, no change; do. do. wire rods, £77, 30s. increase; do. do. h.c. wire, 9½d., ¼d. increase.

Messrs. James & Shakespeare report February 9th:—No change in the prices for copper bars (best selected), sheet and rod; English pig lead, £35 5s., 10s. decrease.

Messrs. Edward Till & Co. report February 9th:—India-rubber, Para fine, 2s. 8d., 1d. decrease.

Salvadoran Customs Decision.—The Government of Salvador has decided to admit electric signs of all types free of all import duties and other charges.

Strike at Yallourn.—Six hundred miners employed at the Victorian Electricity Commission's brown coal mine at Yallourn have gone on strike. The men allege that the Commission is delaying its decision with regard to wages and also that the living conditions in the mine township are "intolerable."—*Reuter.*

Lighting and Power Notes.

Argentina.—BUENOS AIRES.—According to *Power*, after an exhaustive engineering study, the Compania Hispano-Americana de Electricidad is obtaining two tandem-compound steam turbo-generators as the initial installation for the new generating station to be built at the entrance of the harbour of Buenos Aires. Each generator will be a 50,000-kW, 13,200-V, 1,500-r.p.m., machine with a 250-V, d.c. exciter, and a 2,500-kW, 2,300-V service generator with its own d.c. exciter, all mounted on the same shaft.

Barrow.—HYDRO-ELECTRIC SCHEME.—The proposed hydro-electric scheme, which has been under consideration for some time came before the Corporation on February 1st. It is proposed to harness the Backbarrow Falls on the River Leven, which is the outlet of Lake Windermere, and to erect a power station for the accommodation of three 500-kW turbo-alternators. The output is estimated at 4,000,000 kW per annum and the estimated cost is £78,000 for the construction of the station with headrace, pipeline, plant, &c., and £12,000 for transmission lines. A saving of from 4,000 to 5,000 tons of coal per annum is anticipated. The scheme has been held up on account of opposition to the terms of agreement with the Lancashire Ultramarine Co., and the Backbarrow Charcoal Iron Co., for the transfer of their water rights at Backbarrow. The Corporation has now approved the scheme and also the amended terms with the two companies for compensation.

Birkenhead.—ELECTRICITY AGREEMENT.—The Electricity Committee has obtained a draft agreement for an increased supply of electricity in bulk from the Walsall Corporation.

LOAN.—The Committee is applying for sanction to the borrowing of £21,319 for the erection of transformers, rotary converters, and the provision of connecting cables.

Blackburn.—LOAN.—The Town Council, on February 4th, approved of an application for powers to borrow £5,000 for the provision of electric cooking apparatus to be let out on hire.

NEW SUB-STATIONS.—The Council has also approved plans for the erection of sub-stations in Cornelian Street and Cabin End Row.

Blackpool.—LOANS.—The Corporation is applying for sanction to the following loans:—£22,200 for cables; £3,800 for transformer chambers and switchgear; and £9,000 for new phase and frequency changers in connection with the electricity undertaking.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—The fifth generating set of the Cameron Falls power station, Nipigon development, was put into commission on December 1st last. This set was urgently needed as the demand of the Thunder Bay system in November recorded a load at Port Arthur of 26,000 h.p., an increase of over 3,000 h.p. as compared with the corresponding period of the previous year.

Cheltenham.—LOAN SANCTIONED.—The Electricity Committee has received sanction to the borrowing of £9,500 for boiler plant.

Cardiff.—ELECTRICITY EXTENSIONS.—The Electricity Committee has approved, for submission to the Finance Committee, a report submitted by the borough electrical engineer for extensions and replacements at the Roath and Hayes stations, and for mains and sub-station extensions. The report covers a period of two years, and the estimated cost of the extensions is £82,540.

Chester.—WIRING OF SMALL HOUSES.—The Electricity Committee is making application for sanction to borrow £3,000 for the wiring of small houses on the hire purchase system. The Committee has prepared a scheme whereby smaller dwellings may be wired at a cost not exceeding £10. It is proposed that the contractors should first of all have the opportunity of wiring the houses to a schedule prepared by the Committee at a profit. If the contractor does not agree, the Corporation will do the wiring. It is proposed that the occupier or owner should pay 1s. 10d. per £ of the expenditure per month, and in cases where tenants cannot repay in one year, the rates of repayment will be at 2s. 1d. in the £ spread over a period of three years.

MAINS EXTENSIONS.—New distributing mains are required in the eastern portion of the city and for that purpose it is proposed to lay a h.p. underground cable from New Crane street to a sub-station to be erected on land adjoining Hoole Lane, and to lay a further cable from the new sub-station to supply the Great Boughton district. New l.p. cables are also required and the cost of the whole work is estimated at £17,870. The Committee has recommended that application be made for sanction to borrow that sum. The recommendations have been approved by the Council.

Chesterfield.—ELECTRICITY SUPPLY.—The following matters were approved at the January meeting of the Electricity Committee:—A new e.h.p. feeder, to be laid to the Whittington Moor area, to duplicate the existing feeder; distribution mains to be extended to Handley Road, New Whittington; Hasland Green to the borough boundary; Highfield housing estate, and Hunloke Avenue, and overhead distribution in the Holymoorside rural area.

Continental.—GERMANY.—According to *The Times*, a Bill has been introduced into the Prussian Diet for appropriating the sum of 54,000,000 marks for extending the participation of the Prussian State in electrical works. The greater part of the amount has already been spent in acquiring interests in existing works. The proposal is part of a larger scheme of State control of electricity in Prussia.

SPAIN.—The Madrid correspondent of *The Times* reports that the Cabinet has approved the general lines of the new scheme of the Minister of Public Works for the better utilisation of the country's great hydro-electric resources. At present many new works are in course of construction, but owing to insufficient capital they are advancing very slowly. By lumping together the annual State payment towards these works for the next 25 years, the Minister hopes to speed up construction.

CZECHO-SLOVAKIA.—The Ceskomoravska Kolben Co. of Prague has recently completed a 20,000-kVA turbo-generator set for the power station at Seestadtl. The set, which runs at 3,000 r.p.m., is the largest of this type so far constructed in Czecho-Slovakia.

ROUMANIA.—According to a recently-issued report there were 133 central electricity stations in operation in Roumania at the end of 1924, of which 29 are operated by water power, 62 by internal-combustion engines, and the remainder by steam. The largest stations are those at Anina with an annual output of 19 million kWh; the Arad station (steam) with a capacity of 4,000 kW; and the Klausenberg station (steam, internal-combustion engine and water power) with a capacity of 3,200 kW.

AZERBAIJAN.—At a recent meeting of the Elektroplan, the question was discussed of the electrification of Azerbaijan. The plan submitted by the special commission provides for the gradual installation of hydro-electric works on the Araks, Kura, Terter and Samur rivers, the power of the individual works ranging from 30,000 to 60,000 kW.—*Reuter's Trade Service* (Moscow).

Dosthill (Staffs.).—ELECTRICITY SUPPLY.—A canvass of residents has been recently made resulting in applications for electricity supply being received from 95 per cent. of the householders. The Pooley Hall Colliery Co., Ltd., has decided to proceed immediately with the provision of a supply.

East Preston.—ELECTRICITY SUPPLY.—The Rural District Council has decided to consent to the Worthing Electricity Order on condition that the compulsory mains be extended to the villages of Angmering and Ferring, and that the price of electricity in the rural district should not exceed the price in the parish of Durrington.

Elland.—LOAN SANCTIONED.—The Urban District Council has received sanction to the borrowing of £1,000 for domestic apparatus to be let out on hire.

Epsom.—ELECTRICITY SUPPLY.—The Urban District Council has applied for sanction to a loan of £9,000 for renewing mains, and for approval to the installation of two 300-kW Diesel engines.

Gainsborough.—ELECTRICITY SCHEME.—The Council has received a report on the proposed electricity scheme. The cost of the plant is estimated at £8,561, mains and transformers, £10,105, and building, contingencies, and engineer's fees, £6,600. The report has been adopted.

Glasgow.—PROGRESS DURING DECEMBER.—The Corporation electricity manager reports that in December 103 houses were wired under the department's scheme, bringing the total to date to 1,709, while the number of applications for the hire of appliances was 529, making the total to date 9,603.

Glossop.—PURCHASE OF UNDERTAKINGS.—The Finance Committee of the Corporation has again considered the question of the purchase by the Corporation of the electricity and tramway undertakings of the Urban Electric Supply Co., Ltd., in the borough, and has received a report by the consulting engineer, Mr. R. Blackmore, on the proposal. The Committee has recommended the Council to purchase the undertakings at the price set out in the report.

Hastings.—ELECTRICITY AGREEMENT.—The Electricity Committee has entered into an agreement with the Rye Rural District Council for the supply of electricity to the rural district.

LOAN SANCTIONED.—The Committee has received sanction to the borrowing of £12,000 for mains and meters.

Hebden Bridge.—ELECTRICITY SUPPLY.—The Urban District Council is to consider at its next meeting the question of coping with the increased demand for electricity either by increased generation or by an additional bulk supply. In the meantime the Halifax Corporation is being asked to quote for an additional supply.

Irish Free State.—BLACKROCK (CO. DUBLIN).—The Free State Parliament has approved an Order under the Electricity Supply Acts in respect of a scheme for the township and district.

Lairg.—ELECTRICITY EXTENSIONS.—Extensions of the present electricity scheme are proposed and Mr. Claude Pain, in conjunction with Messrs. A. Hugh Seabrook & Partners, has been called in to advise.

Lancaster.—LOAN.—The Electricity Committee is applying for sanction to a loan of £12,500 for electricity purposes.

Leeds.—LOANS.—The Electricity Committee has received sanction to loans of £50,000 for sub-station equipment and £10,500 for sub-station buildings. Sanction is being sought for a loan of £1,600 for electricity services to 500 houses at Neaswood, Cross Gates, and Middleton.

Liverpool.—EXTENSION OF SUPPLY.—The following mains extensions have been authorised by the Corporation:—H.p. main from Smithdown Road sub-station to Lodge Lane sub-station, at an estimated cost of £12,383, and l.p. mains at an approximate cost of £6,295; extension of h.p. mains in Hawthorne Road, at an estimated cost of £1,378, and the provision of the necessary equipment in a sub-station at an approximate cost of £2,000 to supply industrial consumers.

PURCHASE OF UNDERTAKING.—Sanction has been received to the borrowing of £68,449 for the purchase of the undertaking of the Liverpool District Lighting Co., Ltd.

London.—SOUTHWARK.—The Electricity Committee has received sanction to a loan of £7,680 for mains, services, and plant.

Manchester.—PROGRESS DURING DECEMBER.—During the month of December the Corporation electricity undertaking showed an increase in connections of 2,424 kW, bringing the total to 275,836 kW; and the number of applications received for supply, including existing consumers for additional supplies, was 931, representing a total of 2,126 kW. The number of hired cookers connected increased by 108, bringing the total actually on circuit to 1,253. Applications for the hire of cookers totalled 91. One 750-kW converter was put into commission at each of the following sub-stations:—Whalley Range, Didsbury, West Didsbury, and Fallowfield. The Bowker Vale sub-station was also put into commission.

LOAN.—The Electricity Committee has recommended to the Corporation that application be made for sanction to a loan of £50,000 for equipment for distributing stations.

Nantwich.—ELECTRICITY AGREEMENT.—The Urban District Council has approved a draft agreement with the Gwynedd Trust, Ltd., for the supply of electricity to the town.

Newton Abbot.—APPLICATION FOR ORDER.—The Rural District Council having refused its formal consent to an application for an Order to supply electricity in the rural area by the Teignmouth Electric Lighting Co., Ltd., the latter has appealed to the Electricity Commissioners to dispense with the Council's consent.

Rawtenstall.—YEAR'S WORKING.—We have received from Mr. C. L. E. Stewart, borough electrical engineer, a copy of the accounts of the electricity undertaking for the year ended March 31st last. A summary of the accounts shows that there was a total income of £54,470, as compared with £54,032 in the preceding year. Working expenses were higher at £28,425, as against £27,479, and there was a gross profit of £26,045 (£26,553). After deducting capital charges there was a net surplus of £6,368, as compared with £6,339 in 1923-24. The sales of electrical energy increased from 9,140,752 to 9,577,834 kWh, and the average price per kWh obtained fell from 1.367d. to 1.30d.

Reigate.—OPPOSITION TO BILL.—The Town Council has decided to petition against the Bill of the Metropolitan Electric Supply Co., Ltd., which seeks powers to supply within the Council's area and adjacent districts, on the ground that it would be unfair for the company to be given legal powers to compete with the Corporation, which has lately spent a large sum on the development of its undertaking.

Sheffield.—ELECTRICITY EXTENSIONS.—The Electric Supply Committee has approved extensions and works at an estimated cost of £5,608, and extensions of mains for general distribution purposes at an estimated outlay of £17,831.

LINKING UP.—An arrangement has been entered into for the linking-up of the electricity undertakings of the Sheffield and Rotherham Corporations with a cable for an interchange of supply of 10,000 kW, and the agreement provides for an emergency supply of electricity being given by one Corporation to the other. Rotherham Corporation has agreed to allot to the Sheffield Corporation stand-by plant of a capacity of 10,000 kW, and for this service the Sheffield Corporation will make an annual payment. Sheffield Corporation may take from Rotherham a supply of electricity in bulk not exceeding 25 million kWh per annum, with a minimum of five million kWh. The linking-up cable, with subsidiary apparatus, will cost between £40,000 and £50,000, and the cost of this work, as well as the cost of maintenance, will be equally divided between the two Corporations. The agreement is to remain in force for five years from the date of the actual linking-up. The general manager of the Sheffield electricity undertaking reports that by this agreement the extension of the generating station at Blackburn Meadows can be postponed.

Southport.—DOMESTIC APPLIANCES.—The Electricity Committee has received sanction to the borrowing of £5,000 for the purchase of domestic electrical appliances to be hired to the public. The Committee has authorised its electrical engineer to purchase domestic appliances for hire-purchase at a cost not exceeding £2,000 from revenue account.

LOAN.—The Town Council is applying for sanction to a loan of £25,000 for strengthening the network of cables in the town and erecting distributing kiosks in different parts of the district.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the following authorities:—The Sidmouth Urban District Council for authority to supply electricity to certain parishes in the rural district of Honiton; Cement Houses, Ltd., for the supply of electricity in the boroughs of Southend-on-Sea, Chelmsford, and Maldon, the urban districts of Burnham-on-Crouch, and Shoeburyness, and the rural districts of Rochford, Chelmsford, and Maldon.

The Bynamman and District Electric Supply Co., Ltd., has applied for certain amendments to be made in the draft of the Bynamman and District Electricity Order.

United States.—HYDRO-ELECTRIC DEVELOPMENT.—According to *Power*, a station now under construction on King's River in Central California is to operate under an ultimate static head of 2,470 ft. It will be the highest-head hydro-electric plant in America. The San Joaquin Light & Power Corporation expects to have the station in operation within a year. The entire King's River project will involve the expenditure of $50,000,000. The plant will include four of the largest horizontal waterwheel generators in the country. The first of these units, rated at 33,000 kVA, 13,200 V, is being made by the American General Electric Company.

The Philadelphia Electric Co.'s petition for approval of its $52,000,000 hydro-electric scheme, at Conowingo on the Susquehanna River, was allowed on January 12th by the Pennsylvania Public Service Commission. The Public Service Commission of Maryland has already passed the project, and the permission of the Federal Power Commission will probably be forthcoming shortly.

Whitchurch.—APPLICATION FOR ORDER APPROVED.—The Urban District Council has decided to support the application of the Gwynedd Trust, Ltd., for powers to supply electricity in the Council's area.

Tramway and Railway Notes.

Continental.—BELGIUM.—Work is well in hand on the electrification of the local railway between Brussels and Ninove. The section as far as Schepdael is already in operation, and it is anticipated that the complete line will be finished by the autumn. In connection with the work the Société Nationale des Chemins de Fer Vicinaux, of Brussels, is about to invite tenders for the establishment and equipment of a transformer sub-station at Eyseringhen.

The Société d'Electricité de l'Escaut of Antwerp, has recently entered into a contract to supply the whole of the electrical energy required for the operation of the tramway of the Antwerp General Tramways Company.

SWITZERLAND.—It is reported from Berne that the Swiss Federal Railway authorities have recently given orders for 48 additional express electric locomotives. Twenty are to be built by Brown, Boveri & Co., of Baden, 26 by the Oerlikon Maschinenfabrik, Oerlikon, and two by the Ateliers de Sécheron, of Geneva. The last-named company has also secured an order for the electrical equipment of 16 eight-wheel rail motor coaches.

Work is about to be commenced on the construction of an electrically-operated cable railway between Burglen, near Altdorf (Canton of Uri) and the summit of the Kingzig. The line will be about 1¾ miles in length.

FRANCE.—As a result of the satisfactory experiments with the block system of luminous signals on the Asnières-Argenteuil line, the French State railway authorities have decided to adopt it on the Becon-les-Bruyeres-Saint Germain-en-Laye section (10 miles) of the Paris-St. Germain railway, which is at present in course of electrification.

Croydon.—ROUTE TO BE ABANDONED.—The Borough Council, on February 1st, decided to abolish the Addiscombe tramway system, and to complete negotiations for an omnibus service on and beyond that route.

NEW SERVICE.—A through service of L.C.C. tramcars between Victoria Embankment and Croydon and Purley was commenced on February 7th. The length of the route is 14 miles.

Farnworth.—TRAMWAY AGREEMENT.—The Urban District Council, on February 3rd, entered into an agreement with the South Lancashire Tramways Co. for the working, use, maintenance and management of the Council's tramway for a further 21 years as from April, 1927. The company will maintain the track, and take its electricity supply from the Council's electricity undertaking, and the Council is to receive 5 per cent. of the net profits.

India.—CALCUTTA.—The Government has approved the draft agreement with the Calcutta Tramways Co., Ltd., for the construction of a tramway along the main sewer road from Russia Road South to Ballygunge railway station.

BOMBAY.—The Bombay Electric Supply & Tramways Co. is to introduce a railless-car service on one of the tramway routes. The scheme has received the consent of the Corporation.

Keighley.—RAILLESS CARS.—The last of the tramway track was formally removed by the Mayor on February 4th. The heavy cost of track maintenance was the chief cause of the change last year, and Keighley was the first town in the country to abolish tramways entirely and substitute railless-cars.

London.—NEW SUBWAY.—The Corporation of London and the Metropolitan District Railway Co. have come to an arrangement for the construction of a subway to link up Blackfriars Station and the public ways at Blackfriars Bridge.

Southern Railway Electrification.—The Southern Railway Co. has announced that Cannon Street Station will be closed from June 5th to June 28th, in order to enable the work of reconstruction in connection with the electrification of the railway to be proceeded with night and day. From June 28th to July 10th a modified steam and electric service will be run from Cannon Street Station.

From February 28th temporary electric services will be introduced between Charing Cross and Cannon Street and Orpington, and from June 6th temporary electric services will be introduced between Charing Cross and Dartford.

Stoke.—ABOLITION OF TRAMWAYS.—At a recent meeting of the City Council the refusal of the Ministry of Transport to support the Council's action in declining to grant additional omnibus licences to the Potteries Electric Tramways Co. was discussed, and it was decided to appoint a special committee to negotiate with the company on the matter of both tramways and omnibuses with a view to the abolition of tramways if possible.

Telegraph and Telephone Notes.

China.—NEW WIRELESS STATION.—It is reported that a radio station is being constructed at Paotouchen, Suiyuan Special Administrative Area, and the work is expected to be completed shortly.

Denmark.—TELEGRAPH SERVICE.—According to the recently-issued report for the year ending March 31st, 1924, by the Danish Telegraph Authorities, the telegraph system in Denmark at that date comprised 5,388 miles of overhead lines, 525 miles of submarine cables, and 238 miles of underground lines—a total of 6,151 miles.

Hull.—TELEPHONE PROFITS.—A report presented to the Hull Corporation Telephone Committee showed that the profit on the telephone undertaking for the current financial year would exceed £12,000, after allowing for payment of royalties to the Government amounting to £10,900. The Hull Corporation is the only municipality in the kingdom to own a telephone undertaking, and the tariffs are the lowest.

EXCHANGE EXTENSION.—The Municipal Telephone Committee has authorised the provision of additional switches at the Queen's Road exchange, at a cost of £580.

Pacific Cable Board.—CANADA'S THREAT TO WITHDRAW.—Mr. Charles Murphy, Postmaster-General, announces that he has notified the Pacific Cable Board that he will recommend Canada's withdrawal from partnership with Great Britain, Australia, and New Zealand, if the Board persists in the duplication of the Pacific cable between Fiji and Canada.—*Reuter* (Ottawa).

In the Canadian House of Commons, Sir George Perley asked for an assurance from the Government that no such step would be taken without at least first consulting Parliament. Mr. Lapointe, acting leader of the Government, said that correspondence was still proceeding with the Cable Board, and he hoped that an amicable settlement would be reached.—*Reuter* (Ottawa).

Poland.—TELEPHONISTS' STRIKE.—The Inter-Ministerial Commission of Arbitration, which had been summoned to settle the differences of opinion between the telephone operators and their employers at Warsaw, gave its decision on February 4th. The Commission censures the arbitrary conduct of 14 telephonists with regard to their employers, and requests them to return to work at a reduced salary for two months. The manager of the Telephone Company, who had assumed control on behalf of the State, has communicated the details of this decision to the directors of the Telephone Company.—*Reuter* (Warsaw).

Switzerland.—NEW AIRCRAFT STATION.—A wireless telegraph reception and transmission station is to be installed at the aerodrome at Dubendorf, near Zurich.

The Telephone Service.—NEW EXCHANGE AT SALFORD.—Employment for a period of 12 months will be provided for 200 men by the erection of a new telephone exchange at Salford, the largest building undertaking that Manchester has seen for many years. Involving an expenditure of £250,000 and occupying a floor space of six acres, the structure, when completed, will be fitted with apparatus of the automatic type; the building is to be steel-framed throughout, and the 4,000 tons of steelwork required is to be fabricated at the Trafford Park works of Messrs. Edward Wood & Sons.

Radio Notes.

Concerts in the Air.—AIRCRAFT RECEPTION.—Wireless concerts for air travellers were inaugurated on the Paris-London airway on February 1st, when all the passengers by the Air Union noon aeroplane from Le Bourget enjoyed a concert broadcast by the Radio-Paris station.

Daventry.—DISTORTION.—Capt. P. P. Eckersley, chief engineer of the B.B.Co., replying to a letter in *The Times* from a correspondent complaining of unpleasant distortion from the Daventry station, says: "We have had several letters to the same effect. While not wishing to shirk responsibility, it can be proved that, given certain methods of reception, no serious distortion is apparent. This condition is admittedly dependent upon a greater factor of safety in the receiving set than that necessary with short waves. We find that the overwhelming majority of complaints (numbering 150 out of the estimated 100,000 listeners to Daventry) come from users of sets other than crystal. 'Low tone' distortion is often produced by heavy receiver reaction effects, and this, coupled with the fact that we are using a microphone which brings in the 'low' tones more pronouncedly than former types, suggests that our theory of the trouble can be supported, at least, reasonably. It may be, however, that under-modulation in the transmitter caused by some spurious effect would result in the necessity of listeners using more reaction in the receiver than heretofore. Our standard tests have not revealed any defect in the circuits which would account for a lack of modulation; but in order definitely to prove whether some undiscovered effect is present, we are carrying out certain experiments to check performance and to assure ourselves that responsibility for the trouble does not lie with us. My own opinion at the present moment is that the effect is only apparent because of the introduction of a more perfect over-all frequency response in the transmitter, which 'shows up' badly in those receivers which for their sensitivity rely too much upon the use of reaction. Another type of distortion is dependent upon the interference between direct and indirect rays from the station, but this effect, bound up with fading, will only be apparent at very long ranges, upwards of 200 miles. We have no control over this type of distortion except in attempting to keep our wave-length perfectly steady. We have never, and never will, adopt a policy of over-modulating transmitters in the interests of long-distance listeners, and to the detriment of good quality."

Finance.—POST OFFICE PAYMENTS.—Details of the additional money required by Government Departments to cover expenditure which they will have incurred by the end of the financial year in excess of the amount already voted are given in a list of supplementary estimates which was issued last week. The Post Office demands another £847,000, of which sum £223,000 is needed to meet increased payment to the British Broadcasting Co., Ltd.

France.—PROPOSED "LUXURY" TAX.—Many protests have been raised against the proposed new taxes on wireless apparatus, which is classed as a luxury. The French Wireless Union has unanimously adopted a resolution pointing out that wireless is by no means a luxury, as 90 per cent. of the sets belong to modest employés and workers; that it is a powerful element in furthering social progress, and that still wider development of wireless would bring into the Treasury greater resources than the proposed tax, which would restrict such development. The resolution expresses the determination to oppose any tax on ordinary sets, the price of which does not exceed 2,000 fr.—*Reuter* (Paris).

Iceland.—NEW STATION.—The new broadcasting station at Reykjavik has begun testing operations. According to the *Evening News* it transmits at 11 p.m. on a wave-length of 430 metres. The transmitter, which is to be under official control, works on a power of 500 watts, and was installed by Standard Telephones & Cables, Ltd. (Western Electric Co.), one of whose engineers is at present in charge of the station.

Licences.—PROSECUTION.—Supporting a licence prosecution at Willesden, London, on February 4th, a Post Office representative said that defaulters, under the new Wireless Act, committed two offences, and accordingly two summonses were being issued in each case William Boyd, of Cricklewood, was summoned for installing a wireless set without a licence, and for working it without a licence. He pleaded guilty, and the magistrates fined him 10s. for each offence, and said that future offenders would be more severely dealt with.

Spain.—NEW STATION FOR BARCELONA.—The Casa del Aficionado, of Barcelona, manufacturers of wireless telephone material, is about to install a wireless station at Barcelona. This station will be the fourth in that town.—*Reuter's Trade Service* (Madrid).

The Wireless Association.—A NEW CLUB.—The above-named Association, which aims, apparently, at assuming a similar position to that of the Automobile Association in motoring circles, requires its members to sign a pledge that they will refrain from oscillating during broadcasting hours. Amongst the services it proposes to afford its members are accumulator charging at low rates, the hire of receiving sets, technical repair and advice (personal or by post), legal service, and special insurance rates.

United States.—FARMERS' WIRELESS TELEPHONY.—The Sears Roebuck Agricultural Foundation at Dallas recently sent questionaires to farmers in Texas, Oklahoma and Louisiana, asking them to name the benefits received from radio reports. Five hundred replies were recived, of which 163 listeners said that radio service saved them money each year; the average saving was 148.64 dollars per family. Market reports were considered to be the greatest financial advantage.—*Reuter's Trade Service* (Chicago).

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—SYDNEY.—March 31st. New South Wales Government Railways. One air compressor for Zarra Street power house.

April 21st. Four motor-generator sets and four switch-operating batteries for Hornsby and St. Leonards sub-station. Specifications from Chief Electrical Engineer, 61, Hunter Street, Sydney.

MELBOURNE.—April 7th. City Electrical Department. One 2,000-kW rotary converter, with transformer and accessories,* d.c. switchgear and accessories, and one a.c. control panel.*

April 7th. Victorian Government Railways. One hydraulic plate-bending press.*

Aylesbury.—February 16th. Electricity Department. Overhead 11,000-V transmission lines and cables. (January 22nd.)

Belfast. — February 20th. Electricity Department. Twelve months' supply of stores, including electrical accessories, lamps, carbon brushes, electricity meters, &c. (January 29th.)

Belgium.—February 24th. The Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Telephone switchboard, with c.b. and luminous signals, &c., for the central regional and interurban telephone exchange at Verviers. Particulars (cahier des charges special No. 3,160) for 8¼ fr.

Bristol.—February 25th. Board of Guardians. Electrical fittings for six months. Mr. T. S. Lamb, clerk, St. Peter's Hospital.

Cardiff. — February 22nd. Electricity Department. Twelve months' supply of paper-insulated cables, one 1,500-kW rotary converter, and one 2,000-kW ditto. (February 5th.)

March 8th. One 10,000-kW turbo-alternator and condensing plant. (February 5th.)

Cheadle and Gatley.—February 15th. Electricity Department. E.h.p. and l.p. switchgear. Specification from Electrical Engineer and Manager, 37, High Street, Cheadle, Cheshire.

Clitheroe.—February 23rd. Corporation. Transformers, switchgear, and cable connections for sub-station; e.h.p. and l.p. cables, boxes, &c. (January 15th.)

Dundee.—Town Council. Electrical work in connection with 60 Corporation houses. Particulars from Mr. Geo. Baxter, Director of Housing, 91, Commercial Street, Dundee.

Edinburgh.—March 8th. Electricity Supply Department. One 25,000-kW turbo-alternator with condensing plant, or, alternatively, one 20,000-kW turbo-alternator with condensing plant. (February 5th.)

February 16th. One 750-kW motor converter for Leith Substation. (February 5th.)

Halifax.—February 20th. Markets and Parks Committee. Electrical engineering work in connection with the erection of the public abattoirs. Particulars from Borough Engineer, Crossley Street.

Hull.—February 15th. Tramways Committee. Stores required during year ending March 31st, 1927, including carlighting fittings, lamps, cable, and switches. Form of tender, &c., from General Manager, Tramway Offices, Albion Street, Hull.

Leicester.—Electricity Department. One 18,750-kW, 3-phase turbo-alternator, with condensing plant. (See this issue.)

London.—LONDON COUNTY COUNCIL.—February 22nd. H.p. switchgear for Lewisham tramway sub-station. (January 22nd.)

ST. PANCRAS.—March 2nd. Electricity Department. E.h.p. switchgear at the Grafton Road sub-station. (February 5th.)

METROPOLITAN ASYLUMS BOARD.—February 24th. Installations of electric lighting at the Upper Southern Convalescent Fever Hospital and the Joyce Green Hospital, Dartford. Installation of kitchen fittings and appliances at the North-Western Fever Hospital, Lawn Road, N.W.3. (See this issue.)

Manchester.—February 16th. Tramways Committee. Permanent-way points, tongues and crossings and general stores. Schedules from Mr. H. Mattinson, general manager and chief engineer, 55, Piccadilly.

February 23rd. Steelwork for permanent way and parcels depôt.

Board of Guardians. February 13th. Electric lighting at Cottages Homes, Styal, Handforth. February 19th. Electric bed lifts at new pavilions, Booth Hall Infirmary, Charlestown Road, Blackley. Particulars from Mr. F. H. Overmann, architect, 183, Oxford Road, Manchester.

Morley.—Borough Council. Electrician's work in erection of 56 houses, Middleton Road estate. Particulars from Mr. F. Turner, borough engineer, Town Hall.

Newark-upon-Trent.—March 1st. Corporation. Two electrically-driven centrifugal pumps. (February 5th.)

Perth.—February 17th. Corporation. Electric lighting installation at 84 houses. Plans from Burgh Surveyor.

Plymouth.—February 17th. Electricity Department. Twelve months' supply of electricity meters, cables and transformers. (January 29th.)

Retford.—February 19th. East Retford Gas, Water and Electricity Department. Electricity generating plant, mains, transformers, and meters. (January 22nd.)

Richmond-on-Thames.—February 22nd. Town Council. Electrically-driven centrifugal pump, with motor, switchgear, &c. Mr. Hugh P. Williamson, water engineer, Riverside.

Salford.—February 18th. Electricity Department. Coal supplies required during six months commencing March 1st, 1926. Particulars from Borough Electrical Engineer, Frederick Road, Salford.

South Africa.—JOHANNESBURG.—February 25th. Municipal Council. Four d.c. switchgear panels and 3-phase, truck-type ironclad switchgear panels.*

February 25th. S.A. Railways and Harbours. Two 4-ton electrically-driven fixed wharf cranes for Luderitz jetty.*

One 7-ton and five 4-ton electrically-driven portal cranes, complete.*

Electrification of Cape Town Suburban Railway. Supply and erection of the overhead equipment of the permanent way and overhead transmission and distribution lines. (See this issue.)

PRETORIA.—February 25th. Postmaster-General's Department. Supply of a manual telephone exchange for Hatfield, Pretoria. Controller of P.O. Stores, Pretoria.

February 25th. Union Tender Board. Miscellaneous telegraph and telephone materials (C×1880).*

CAPE TOWN.—March 17th. Electricity Department. Electric cables, electric light poles, cross arms, insulators, &c.

MOOREESBURG.—March 20th. Municipal Council. Engine-room equipment, including oil engines and tanks, main generators, motor booster, pumps and air compressor, travelling crane, switchboard, battery and connections, distribution system, instruments, meters, &c.; and house service connections.*

Spain.—MADRID.—La Junta de Obras del Puerto de Castellón de la Plana. A 3-ton electric crane.—*Reuter's Trade Service* (Madrid).

Sutton Coldfield.—February 17th. Electricity Department. E.h.p. underground main, rotary converting plant and switchgear, and automatic rotary converting plant and switchgear, or mercury-arc rectifiers. (February 5th.)

Watford.—February 23rd. Board of Guardians. Electric lighting installation, consisting of wiring old buildings, new power mains, motors, main switchboard, &c. Specifications from the Master's office, 60, Vicarage Road, Watford, or from the consulting engineer, Mr. W. M. Benny, 39, Carlton Road, Putney, S.W.15.

Wrexham.—February 18th. Electric lighting installation at Miners' Hall and Institute, Rhos. Specification from Mr. J. Owen and Mr. F. A. Roberts, architects, Westminster Bank Chambers, Wrexham.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Birkenhead.—Electricity Committee. Accepted:—

1,500-kW rotary converter (£5,417); and 750-kW converter (£3,272).—Metropolitan-Vickers Electrical Co., Ltd.
Cable.—Hackbridge Cable Co., Ltd. (£2,139); Macintosh Cable Co., Ltd. (£116); W. T. Henley's Telegraph Works Co., Ltd. (£1,140).
Two 200 kVA transformers (£355).—General Electric Co., Ltd.
Switchgear for Bromborough sub-station.—Ferguson, Pailin, Ltd. (£948); English Electric Co., Ltd. (£222).
Switchgear for Beaufort Road sub-station (£100).—British Thomson-Houston Co., Ltd.

Bradford.—Tramways Committee. Accepted:—

58 steel gear wheels and 60 steel pinions for tramcars (£522).—David Brown & Sons (Huddersfield), Ltd.
Three one-man electric trolley vehicles (£1,445 each).—Associated Equipment Co., Ltd.
Three ditto (£1,530 each).—Richard Garrett & Sons, Ltd.

Electricity Committee. Accepted:—

One auxiliary motor-generator for Valley Road generating station.—Crompton & Co., Ltd.

Markets and Fairs Committee. Accepted:—

Illuminated signs at Kirkgate and Rawson Place Markets.—J. Akers (10 signs, £186); wiring signs (£163).—Smith & Croft.

Great Horton Co-operative Society, Ltd. Accepted:—

Electrical installation at new branch store, Brownroyd Hill.—A. Higginbotham & Son.

Bury.—The Town Council has decided to complete agreements with the English Electric Co., Ltd., and the General Electric Co., Ltd., in connection with the conversion of eight bogie cars, and with the De Laval, Chadburn Co., Ltd., for the supply of an oil purifier to the electricity department.

Chesterfield.—Electricity Committee. Accepted:—

E.h.p. and l.p. cables (£3,164).—Macintosh Cable Co., Ltd.
E.h.p. switch cubicles (£271).—British Thomson-Houston Co., Ltd.

Cornforth.—The Parish Council has accepted the tender of Wilson Fleetham, Coxhoe, at 8s. per lamp per annum for cleaning, maintaining and repairing and providing and fixing bulbs required for 140 electric street lamps.

Derby.—Tramways Committee. Accepted:—

Six car bodies, roof covers, and trucks (£7,050).—Brush Electrical Engineering Co., Ltd.
Six electrical equipments (£3,737).—British Thomson-Houston Co., Ltd.

Durham.—County Council. Accepted:—

Telephones at premises, Old Street (£78).—Kelly & Co.
Electric lighting installation at school at Tursdale (£113).—Reid, Ferens and Co.

Eastbourne.—Electricity Committee.

2,500-kW turbo-alternator:—

Oerlikon, Ltd.	£12,021
Escher, Wyss-Boveri	12,024
English Electric Co., Ltd.	12,108
Belliss & Morcom, Ltd.	12,142
A.E.G.	12,830
Metropolitan-Vickers Electrical Co., Ltd.	12,836
C. A. Parsons & Co., Ltd.	13,759
British Thomson-Houston Co., Ltd.	14,393
Fraser & Chalmers Engineering Works	14,538
Richardsons, Westgarth & Co., Ltd.	14,560
Allen, Sons & Co., Ltd. (Recommended.)	**14,754**
Browett, Lindley & Co., Ltd.	15,385
Brush Electrical Engineering Co., Ltd.	15,785
J. Howden & Co., Ltd.	16,475

Boiler, stoker, economiser, &c.:—

Stirling Boiler Co., Ltd. (Recommended.)	**£11,838**
John Thompson Water Tube Boilers, Ltd.	11,097
Babcock & Wilcox, Ltd.	11,863
Vickers-Spearing Boiler Co., Ltd.	12 040
Clarke, Chapman & Co., Ltd.	12,219
Richardsons, Westgarth & Co., Ltd.	12,305
J. S. White & Co., Ltd.	17,937

200,000-gal. cooling tower and tank:—

Premier Cooling & Engineering Co., Ltd. (Recommended.)	**£1,887**
Visco Engineering Co., Ltd.	1,908
Clyne Engineering Co., Ltd.	2,150
Davenport Engineering Co., Ltd.	2,155
Richardsons, Westgarth & Co., Ltd.	2 160
Film Cooling Towers, Ltd.	2,170
Hudson Economiser Co.	2,298

Glasgow.—Tramways Committee. Accepted:—

Commutators.—P. R. Jackson & Co., Ltd.
Car chains (brake).—Weldless Chains, Ltd.

Hastings.—Electricity Committee. Accepted:—

H.p. switchboard at Shepherd Street sub-station (£464).—Ferguson, Pailin, Ltd.

Hull.—Tramways Committee. Accepted:—

Two switches, 100 ft. radius (£94); and one switch, 130 ft. radius (£58).—Hadfields, Ltd.

Liverpool.—Water Committee. Accepted:—

Electrically-driven centrifugal pump for Dudlow Lane pumping station (£1,400).—W. H. Allen, Sons & Co., Ltd.

Irish Free State.—The following contracts were among those placed by the Controller of Stores, Department of Posts and Telegraphs, Dublin, from December 21st to January 22nd, inclusive :—

Cable.—Siemens-Schuckert (Ireland), Ltd.; and W. T. Henley's Telegraph Works Co., Ltd.
Cable switchboard.—W. F. Dennis & Co.
Dry cells.—Edison Swan Electric Co., Ltd.; and Allen Liversidge, Ltd.
Porous Leclanché cells.—Siemens Bros. & Co., Ltd.; and General Electric Co., Ltd.
Platinum contacts.—Marconi's Wireless Telegraph Co., Ltd.
Jointing sleeves.—Dugard Bros., Ltd.
Telephone keys.—Sterling Telephone & Electric Co., Ltd.
Telephone relays.—Standard Telephone & Cables Co., Ltd.; British L. M. Ericsson Mfg. Co., Ltd.; International Electric Co., Ltd.
Tungar battery charger and parts.—British Thomson-Houston Co., Ltd.
Fuseboards.—Standard Telephones & Cables, Ltd.
Generators.—Siemens Bros. & Co., Ltd.
Enamelled and flameproof wire.—S. G. Leach & Co., Ltd.
Switchboard wire.—Celtic Electric Co.
Zinc rods (Leclanché).—Eyre Smelting Co., Ltd.—*Irish Builder and Engineer.*

Leeds.—Tramways Committee. Accepted:—
Points, crossings, and special work.—Edgar Allen & Co., Ltd. (£2,301); Thermit, Ltd. (£247).

Electricity Committee. Accepted :—
Cable.—W. T. Henley's Telegraph Works Co., Ltd. (£3,955); Enfield Cable Works Ltd. (£1,346); Macintosh Cable Co., Ltd. (£370).

Sewage Committee. Accepted :—
Electric lighting work at Thorpe Stapleton pumping station (£262).—Wilson Hartnell Installations, Ltd.

London.—ADMIRALTY.
3,300 accumulators.—Edison Swan Electric Co., Ltd.

HACKNEY.—Electricity Committee. Recommended :—
Air compressor (£110).—Reavell & Co., Ltd.
One Weir turbine feed pump (£525).—G. & J. Weir, Ltd.

HAMMERSMITH.—Electricity Committee. Accepted :—
Two 250-kW oil-cooled transformers (£400).—Hackbridge Electric Construction Co., Ltd.

METROPOLITAN ASYLUMS BOARD.—Works Committee.—The following tenders were received for the installation of electric lighting at Darenth Training Colony :—

Read & Partners, Ltd.	£8,192
Kershaws	8,431
Brightside Foundry & Engineering Co., Ltd.	9,040
S. Dixon & Son, Ltd.	9,750
T. Clarke & Co., Ltd.	10,000
Toy & Winslow	10,285
Direct Electric Service (Bury), Ltd.	10,380
Coley & Swinnerton, Ltd.	10,425
G. N. Haden & Sons, Ltd.	10,440
A. Higginbotham	11,100
Smethurst & Co., Ltd.	11,900
Douglas Electric Lighting & Power Co.	11,977
H. B. Giles	12,185
Taylor & Allen, Ltd.	12,885
R. Hunt & Co., Ltd.	12,960
Pinching & Walton	15,000
A. Innes	15,561
Jenner Light & Power Co., Ltd.	18,880

Maidenhead.—Town Council. Accepted:—
Electric fire siren (£83).—S. G. Leach & Co., Ltd.

Manchester.—Electricity Committee. Accepted:—
Two 750-kVA static transformers.—Hackbridge Electric Construction Co., Ltd.
3-phase induction regulator.—English Electric Co., Ltd.

Tramways Committee. Accepted :—
Trial equipment of "Maley" electro-pneumatic brake on tramcar.—Electro-Mechanical Brake Co., Ltd.
Steel girder tramway rails.—Cargo Fleet Iron Co., Ltd.

Education Committee. Accepted :—
Electric lighting at Ashton Road clinic.—Harrisons, Ltd.
Rearrangement of electric lighting at Ashton school.—R. Seddon & Sons.

Navan.—County Meath Board of Health. Accepted:—
Electric lighting installation at new County Hospital (£310).—Gilbert Bros. (11 tenders were submitted.)

Plymouth.—Health Committee. Accepted:—
Dynamo at sanatorium (£60).—W. H. Heath & Co.

Salford.—Tramways Committee. Accepted:—
30 fully-enclosed top covers, including new seats and canopies, and 60 lower vestibule ends and staircases for small cars (£18,930).—Massey Bros.

Southampton.—Education Committee. Accepted:—
Installing electric lighting at the new Taunton school (£928).—Groves and Co.

Forthcoming Events.

Physical Society of London.—Friday, February 12th. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Annual general meeting.

Institution of Engineering Inspection.—Friday, February 12th. At the Royal Society of Arts, John Street, Adelphi, W.C. At 7.30 p.m. Paper on "The Application of Special Cast Irons in the Engineering Industry," by Mr. S. E. Dawson.

Electrical Engineers' Ball.—Friday, February 12th. At the Hotel Cecil, Strand, W.C.

British Electrical and Allied Industries Research Association.—Friday, February 12th. At the Savoy Hotel, Strand, W.C. Annual general meeting and luncheon.

Junior Institution of Engineers.—Friday, February 12th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecture on "A Visit to Some Power Stations in the U.S.A. in 1925," by Mr. W. H. Patchell.
Saturday, February 13th. At Holborn Hall. From 7.30 to 11 p.m. Annual dance.

Electrical Trades Commercial Travellers' Association.—Saturday, February 13th. At the Manchester Hotel, E.C. At 6.30 for 7 p.m. First annual dinner.

British Industries Fair.—February 15th to 26th. At the White City, London, W., and the Castle Bromwich Aerodrome, Birmingham.

Association of Mining Electrical Engineers (London Branch).—Tuesday, February 16th. At the Junior Institution of Engineers, 39, Victoria Street, S.W. At 6.30 p.m. Paper on "Mining Signalling Apparatus and Telephones," by Mr. O. D. Kennedy.

Royal Society of Arts.—Wednesday, February 17th. At John Street, Adelphi, W.C.2. At 8 p.m. Lecture on "The Propagation of Electric Waves," by Mr. J. E. Taylor.
Monday, February 15th. At 8 p.m. Cantor Lecture on "The Production and Measurement of High Vacua," by Dr. G. W. C. Kaye.

Edinburgh Electrical Society.—Wednesday, February 17th. At the Royal Scottish Society of Art, 117, George Street. At 8 p.m. Paper, "A Talk on Cables," by Mr. F. Stevenson.

Poplar School of Engineering, Old Boys' Society.—Wednesday, February 17th. At the School of Engineering, High Street, Poplar, E. At 7.45 p.m. Paper on "Present-day Development in the Electrical Supply Industry," by Mr. O. L. Robson.

Institution of Electrical Engineers.—Thursday, February 18th. At the Institution, Victoria Embankment, W.C. At 6 p.m. Joint meeting with the British Section of the French Society of Civil Engineers. Paper on "The Electrification of the Paris-Orleans Railway," by M. Parodi

(Mersey and North Wales (Liverpool) Centre).—Monday, February 15th. At the University, Liverpool. At 7 p.m. Paper on "Dielectric Problems in High-Voltage Cables," by Capt. P. Dunsheath.

(North-Western Centre).—Tuesday, February 16th. At the Milton Hall, Deansgate, Manchester. At 7.30 p.m. Joint meeting with the Institution of P.O. Electrical Engineers. Lecture on "Wireless," by Mr. E. H. Shaughnessey.

(Scottish Centre).—Wednesday, February 17th. At the Grosvenor Restaurant, Glasgow. Semi-Jubilee function (Ladies' Evening), dinner, whist and dancing.

(South-Midland Centre).—Wednesday, February 17th. At the University, Birmingham. At 7 p.m. Paper on "The Electrification of the Paris-Orleans Railway," by M. Parodi.

(Tees-Side Sub-Centre).—Monday, February 15th. At the Cleveland Technical Institute, Middlesbrough. At 7.15 p.m. Paper by Mr. C. W. Blacklock.

(North-Midland Students' Centre).—Tuesday, February 16th. At the Technical College, Bradford. At 7 p.m. Paper on "Storage Batteries for Power-station Service," by Mr. C. A. Wilson.

Diesel Engine Users' Association.—Friday, February 19th. At Caxton Hall, Westminster, S.W.1. Paper on "Heavy Oil Engine Installations—Choice of Site and Lay-out of Plant," by Mr. G. Porter.

Manchester Electro-Harmonic Society.—Friday, February 19th. At the Albion Hotel, Piccadilly, Manchester. Concert.

British Electrical Development Association Conference.—Friday, February 19th. At Caxton Hall, Westminster. Lecture on "The Electrical Industry and the Architect," by Mr. G. Blair Imrie.

Institution of Mechanical Engineers.—Friday, February 19th. At the Institution, Storey's Gate, S.W. At 6 p.m. Annual general meeting. Paper on the "Measurement of Cutting Temperatures," by Mr. E. G. Herbert.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

Moulded candles having imitation "tears" at the top and sides.

Lighting cables and sockets suitable for the external lighting of ships when illuminated in connection with regattas or other special occasions.

Notes.

Appointments Vacant.—The United River Plate Telephone Co. requires several engineers for its permanent staff in Buenos Aires; draughtsman (£337), for the City of Birmingham electricity department; combustion engineer (£327) and assistant power station superintendent (£360), for the Borough of St. Helens electricity department; wireman, for the Cornwall Mental Hospital, Bodmin; meter superintendent (£208), for the Nuneaton Corporation electricity department; shift charge engineer, for the Mersey Power Co., Ltd. (See our advertisement pages to-day.)

The Hastings Hum.—With regard to the "hum" which, it was alleged by the lay Press, was annoying the residents at Hastings, we have ascertained from the borough electrical engineer, Mr. Russell F. Ferguson, that it was caused through the ash pit acting like a loud speaker. The ash pit tapers down from the front, and then continues with a gentle slope to the back; the remedy was to put in concrete so as to make a gradual slope from the front to about 10 in. under the chain-grate stoker at the back. The cause of the trouble was discovered by a member of the operating staff, and by placing corrugated sheet iron underneath the stokers, the correct angles which suppressed the sound were found. The matter was very simple, once the spot where the trouble lay had been localised.

Boiler Explosion Report.—We have received a copy of the report of a preliminary inquiry on the explosion from a water tube boiler at the West Ham generating station on April 29th last. The boiler was made by the Stirling Boiler Co., Ltd., in 1920, and was first put on commercial load at West Ham in 1922. One of the front-row tubes burst, forming an aperture 13.5 in. long and 7.5 in. wide (maximum). The contents of the boiler escaped through the opening, projecting flames and vapour from under the grate to the boiler opposite. The tube immediately behind that which failed was bent backwards by the force of the explosion. The latter appears to have been the result of over-heating, the cause of which was removed when the tube failed. The tube which failed had only been in service for about ten weeks and the quantity of scale found in any part of it did not exceed 1/32 in. The tube had also bulged both in the solid and fractured parts.

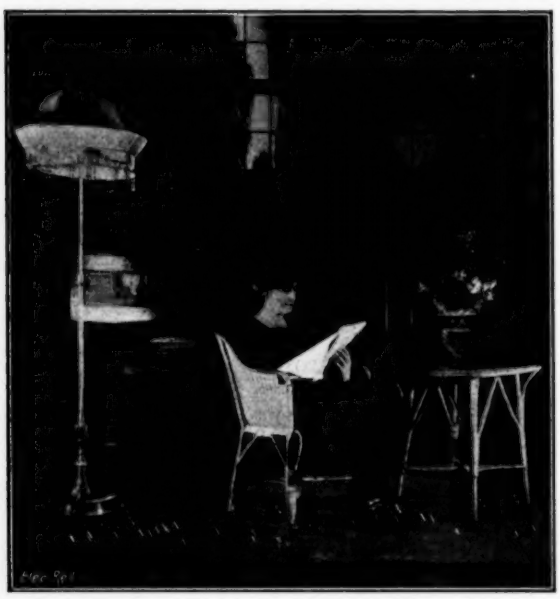
Local Society.—A lecture on "The Influence of Light in Industry and Commerce" was delivered before the Edinburgh Electrical Society on February 3rd by Mr. H. E. Hughes, of the Scottish Electric Lighting Service Bureau. The developments were traced and comparisons made of artificial lighting from the carbon lamp up to the present day manufacture. Raw or glare light was condemned and the proper reflection and control of light explained. Industrial and shop lighting methods were discussed and a number of excellent lantern slides shown.

Ontario Hydro-Electric Power. — The December *Bulletin* of the Hydro-Electric Power Commission of Ontario shows that the Commission's various plants have a total capacity of 942,028 h.p. This figure is very close to the ultimate development contemplated, which is given as 1,068,728 h.p. The Niagara system possesses the bulk of the plant (788,500 h.p.), and only 10,000 h.p. remains to be developed there under present arrangements. A further 25,000 h.p. is being harnessed at the Thunder Bay system, and 10,500 h.p. at the Georgian Bay system.

French Scientific Activities.—We are informed that the fiftieth anniversary of the birth of the "Association pour l'Avancement des Sciences" will be celebrated at the 1926 Congress of the Association which is to be held at Lyons. Between July 24th and August 1st there will also be held a large international exhibition in the Fair Palace, Lyons, representing all that relates to applied science.

G.E.C. Research Laboratories' Visit.—At the invitation of the General Electric Co., Ltd., a large party of science masters attending the Annual Conference of the Science Masters' Association in London, recently visited the G.E.C. Research Laboratories at Wembley, and were conducted through the various testing and experimental rooms. Particular interest was shown by the visitors in the work in progress in the vacuum physics laboratory and the experimental tungsten wire model factory. A special party visited the Osram lamp works at Hammersmith; over 200 members accepted the invitation extended to the Association.

A Lady Demonstrator at Home.—The accompanying illustration depicts what might be a lounge in a comfortable country mansion. But it is not; it is a section of the Hackney



A Lady Demonstrator "At Home."

electrical demonstration halls, with Mrs. A. M. Pearmain, the supervisor of domestic electrical appliances, "in the chair."

The Electrical Research Association.—The report of the Council of the British Electrical and Allied Industries Research Association for the year ended September 30th, 1925, to be submitted to the annual general meeting to-day, contains a foreword by Mr. Ll. B. Atkinson, chairman of Council, pointing out that the five years' agreement between the Department of Scientific and Industrial Research and the Association ended with the period under review; he expresses gratification at the satisfactory results achieved in that time, seeing that the organisation had to be built up. In future the grants from the Department will progressively diminish, and contributions to the funds must be sought from other sources.

The report states that the Department appointed a committee of investigation, whose report expressed high appreciation of the work of the Association. Subscriptions and grants have been promised, sufficient to cover the minimum requirements of the Association for a further five years.

Researches are in progress in connection with dielectrics in general, and a comprehensive programme of fundamental research into the properties of insulating materials has been under consideration, but at present the funds are not sufficient to permit of its being put in hand. Proposed purchasing specifications have been issued for pressboard, cotton fabric, and shellac; investigations on synthetic resins and hard composite dielectrics have been completed; and researches have been carried out on insulating oils, porcelain, mica and micanite, buried cables, and poles for overhead lines. It is stated that a heavy testing set built specially for testing switchgear could be kept continuously employed, and that new results would in all probability be obtained. Researches on switchgear and fusible cut-outs, steam condensers, and steam turbines have been continued, and it is estimated that the nozzles research has enabled a saving of 3 per cent. in the steam consumption of large turbines to be made. Extended steam tables have been prepared. Confidential researches on transformer steel and phosphor-bronze springs have been put in hand, and the question of telephone interference has been studied. Many reports, some of which are confidential, have been issued.

A folding diagram illustrates the organisation of the Association and its numerous sections and sub-committees, and the personnel of the latter, as well as lists of members and associate members of the Association, is appended to the Report.

Educational.—FARADAY HOUSE SCHOLARSHIPS.—The annual examinations for a Faraday scholarship of fifty guineas per annum (tenable for two years in college and one year in manufacturing works) and for a Maxwell scholarship of fifty guineas per annum (tenable for one year in college and one year in works) will be held at Faraday House, on April 7th, 8th, and 9th, 1926. Exhibitions may also be awarded to candidates who acquit themselves creditably in the above examinations, but do not obtain the necessary number of marks to qualify for a scholarship. Further particulars may be obtained from the Secretary, Faraday House, 62-70, Southampton Row, London, W.C.1.

Difficulties in Interviewing.—The following is a copy of a letter received by an electricity supply undertaking:—

"I called to-night the second time to make inquiries in reference to having electric light laid on in my flat in this house. Never in any place have I met a man less able or less willing to give the required information. He reeled off whole paragraphs about volts and units and divisions of thousands by forties, all of which is quite incomprehensible to any person knowing nothing about the measurements of electricity; and I venture to say that such people are the greatest majority by far. What I wanted to know, and still want to know is how the price of electricity compares with gas. When I asked that question, I was told most off-handedly, "he thought it would be cheaper." I then said I could not act on thought, and told him what the average cost of my gas is, hoping he might be able to make some comparison. All the reply I received was "you had better stick to your gas." However, I still tried to get information, but came away about as well informed as before I called. With me, as with most people, the question is "will electricity laid on by the company work out at about the same cost as gas, or will it be more expensive?" We do not need to be told it is cleaner and a greater comfort. We know that, but the comfort most people can have is regulated by their purses. Surely the company could make comparable tables that would be intelligible to the ordinary person. I have no doubt that had I been an attractive young lady I should have been most graciously given the information I required by the young man; but as the management of most houses is in the hands of women not quite young, it may be worth the company's while to have an attendant especially for elderly and stupid (!) women."

[If, as the writer of the letter says, the supply assistant reeled off whole paragraphs about volts, &c., it does not bear out the lady's impression that he was unwilling to impart information: but it does suggest that the use of technical terms may have irritated her. All prospective consumers cannot, of course, be treated alike, and the writer of the letter may prove to be one of those cases where the strict avoidance of technical terms and a generous supply of tact will produce the desired results.]

Ex-British Westinghouse Association.—An invitation has been "broadcast" to members of this Association to attend the dinner on Friday, March 5th, at the Holborn Restaurant, London. Tickets may be obtained from Mr. W. E. Warrilow, 40, Mildred Avenue, Watford, Herts.

Telephone Exchange Model.—A demonstration set, comprising a working model of the outgoing and incoming sections of a telephone exchange, has been completed by the London telephone authorities, and arrangements are in hand for a course of lectures to literary and other societies in London which may be interested in the subject. Applications from such societies for particulars of the lectures will be welcomed. The adoption of the correct methods of operating by subscribers is important, and arrangements have been made for many visits to exchanges, both in the case of individual subscribers and of parties, the latter including parties from engineering colleges, public schools, L.C.C. evening institutes, borough council municipal colleges, members of local Chambers of Commerce, representatives of overseas telephone corporations, City of London institutes, clubs, workers' educational associations, and students from abroad. A correct view, on the part of subscribers, of the general working of the system is very important, and there is abundant testimony as to the value of such visits of exchanges. The London Telephone Service welcomes personal examination by any subscriber of the organisation and working of the exchange which serves him, or of any other exchange he desires to see.

National Association of Supervising Electricians.—The annual meeting of members of the National Association of Supervising Electricians was held on February 2nd at the Junior Institution of Engineers, 39, Victoria Street, London, S.W.1, and was attended by a large audience. Mr. W. J. Revell, the chairman of the Association, in his address, referred to the growth of the Association financially and numerically, and emphasised the important position it now occupied in the electrical industry, which was the result of the general policy of the Association with regard to admittance of only qualified men, and its outlook on industrial matters. The educational activities for the past 12 months had increased, and included lectures, debating society meetings, works visits, the W. E. Highfield Shield, the "Economic Premium" Competition, and the N.A.S.E. Scholarship scheme. In referring to the Employment Bureau, Mr. Revell said that it was gratifying to know that positions ranging from £300 to £500 per year had been secured for a number of the members, the success in this direction being in advance of previous achievements. It was becoming recognised that membership of the Association was, generally speaking, a qualification. The chairman also made reference to the fact that the N.A.S.E. continued to be represented on the I.E.E. Wiring Rules and B.E.S.A. Committees. He referred to the regrettable resignation of Mr. Frank Gill, M.Inst.C.E., M.I.E.E., the president of the Association, owing to business abroad, and said they had been fortunate in securing Mr. A. M. Sillar, M.Inst.C.E., M.I.E.E., M.I.Mech.E., as the new president of the Association, and he appealed to the membership to give Mr. Sillar their loyal support.

The following were elected to fill the five vacancies on the Board of Control according to rule:—Messrs. C. Bull, J. Cowan, E. L. Eastell, B. C. Garman, and F. W. Smith. Messrs. F. E. Phillips and B. S. Westaway were elected auditors.

Electricity as a Public Utility.—Col. Oakley (chairman of the Basingstoke Corporation Electricity Committee) presided at a meeting held in the Town Hall on January 27th, when an address, with lantern illustrations, was given by Mr. J. W. Beauchamp, secretary of the British Electrical Development Association, on "Electricity as a Public Utility." In the course of his remarks, Mr. Beauchamp mentioned that there were about 25,000 electric ranges in use in this country.

Fatality.—On February 8th, two Post Office electrical engineers, A. W. White and W. F. G. Merritt, received fatal injuries owing to the collapse of a telephone standard on which they were working, falling from the top of a five-storey building on to the "live" line of the Metropolitan Railway at Farringdon Street Station. White was killed by electric shock, and Merritt died from his injuries in St. Bartholomew's Hospital.

International Electrotechnical Commission.—Arrangements for the meetings of the I.E.C., which are to commence in New York on April 13th next, are now completed. The technical sessions will commence on April 13th and continue until the 16th, when there will be a break of two days; they will recommence on the 19th, and, it is hoped, conclude on the 22nd. Since The Hague meeting the various National Committees have been considering the proposals that emanated from that meeting. A number of experts' papers on the important question of the rating of electrical machines are to be presented, and probably apart from that question one of the most important subjects to be discussed will be the rating of hydraulic and steam turbines for electrical plant. Other subjects include transformer oils, traction motors, &c., details of which will receive attention at New York.

At the conclusion of the technical meetings, the United States and Canadian Committees (hosts of the International Commission) are providing free transportation and sleeping-car accommodation for a tour of some 2,500 miles that will include visits to: Washington, Philadelphia, Baltimore, Pittsburgh, Chicago, Detroit, Niagara Falls (two days), Toronto, Montreal, and Schenectady. At Niagara the Canadian Committee will take over the party and visit Toronto and Montreal. The United States Committee will then take the party to Schenectady and back to New York, the tour terminating on May 8th.

The delegates from Europe are to travel in the Cunard s.s. *Andania*, sailing from Hamburg on March 31st, and Southampton and Cherbourg on April 2nd, and it is evident that this meeting in New York will be well attended. It is the first time that a plenary meeting of the I.E.C. has been held in America, although the St. Louis Exposition of 1904 was practically the birthplace of the Commission. The National Committees are adding to their working delegates a number of influential representatives to do honour to the occasion.

Institution Notes.

Institution of Electrical Engineers.—SCOTTISH CENTRE.—The Scottish Centre of the Institution, whose headquarters are in Glasgow, is to celebrate its semi-jubilee with a ladies' evening on the 17th inst. The function will take the form of a dinner, followed by whist and dancing. Prof. Magnus Maclean, chairman of the Centre, will be in the chair.

Physical Society of London.—CHANGE OF ADDRESS.—The registered office of the Society has been moved to 30, Great Russell Street, London, W.C.1.

Society of Engineers.—The report of the Council for the year 1925 shows that the membership has increased by 41 to 611, and there are 10 associated societies. The president for 1926 is Mr. G. O. Case.

Incorporated Municipal Electrical Association.—SUMMER MEETING.—In connection with the visit to Glasgow in June next of the Association for its annual conference, a request for the use of the banqueting hall at the Municipal Buildings for a reception has been granted. The Electricity Committee is to entertain the visitors.

Institute of Transport.—It is announced that the paper on "State Ownership of Waterways," to be read before the above Institute at the Institution of Electrical Engineers, on Monday, March 1st, will be delivered by Mr. H. D. Dickinson of the University, Leeds, instead of by Prof. J. H. Jones, M.A., as previously stated.

Junior Institution of Engineers.—A question and discussion evening was held on February 5th, and was very successful. Questions on the following subjects, amongst others, were raised, and in every case an answer was forthcoming:—Pressure gauges for the air supply to boilers; interference between wireless receivers in restricted areas; the testing of rotors for dynamic balance; and the prevention of rust in workshops in mild and moist weather.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

Watford Urban Council has decided to award the sum of £500 to the borough electrical engineer, Mr. BARHAM, in recognition of the special technical work involved in the erection of the new power station, and the changing-over from single-phase to 3-phase. Sums of £75 each have also been granted to Messrs. GREENHALGH and WALLEY in recognition of special assistance given to the engineer.

Mr. L. G. SIMS, M.Sc., has been appointed by the Council of the University of Birmingham lecturer in electrical engineering, vice Mr. O. R. Randall, Ph.D., M.Sc., B.Sc. (Lond.), who has been appointed professor of electrotechnics at the Witwatersrand University, Johannesburg.

Mr. REDMAN, the electrical engineer of Shipley, has been seriously ill, and is still confined to his house. The Electricity Committee has expressed its best wishes for his speedy and complete recovery.

BAILIE HIGGINS, the sub-convener of the Glasgow Corporation Electricity Committee, has been elected for a further period of three years as Clyde organiser of the Electrical Trades Union, a post he has held for the last six years.

Southport Corporation is recommended to increase the salary of Mr. A. LATHOM, mains assistant, to £273 12s. per annum.

The marriage took place at St. Mary's Church, Bearwood, Birmingham, on January 23rd, of Mr. CECIL A. KERSHAW, of the London staff of Messrs. Merz & McLellan, consulting electrical engineers, and Miss DORIS ROBERTS, of Talbot Road, Bearwood.

The Bradford Corporation last week referred back to the Estimates Sub-Committee for further consideration a series of proposed salary increases, including that of Mr. THOS. ROLES, city electrical engineer, whose present salary is £1,500, and the increase recommended was £100 per annum to the maximum salary at present provided for the position.

Obituary.—ALD. E. PRIESTLEY.—The chairman of the Bradford Tramways Committee, Alderman Enoch Priestley, was killed on the L. & N.E. Railway on February 2nd. He was 71 years of age. At an inquest a verdict of "Accidental death" was returned.

MR. T. W. WARD.—We regret to record that Mr. T. W. Ward, a founder of the firm of T. W. Ward, Ltd., iron, steel, and machinery merchants, of Sheffield, passed away recently at the age of 72 years. Mr. Joseph Ward, brother, has been managing director of the company for some time past, but Mr. T. W. Ward was a director up to the time of his death.

MR. J. C. B. INGLEBY.—The death is reported of Mr. J. C. B. Ingleby, managing director of the Electric Motor and Stove Hiring Co., Leeds.

MR. A. E. GIFFEN.—Mr. Alexander Ewing Giffen, chief of the Post Office Engineering Department in the North Staffordshire and South Cheshire area, died last week at the age of 55.

MR. J. V. MOINET.—The death has taken place at Hamilton of Mr. J. V. Moinet, burgh electrical engineer and manager. Mr. Moinet, who had been Messrs. Edmundson's resident engineer and manager, accepted the invitation of the Town Council to continue as official in charge when the works were taken over at the beginning of this year. Mr. Moinet was at Scarborough before going to Hamilton.

SIR T. BROOKE-HITCHING.—Sir Thomas Henry Brooke-Hitching, who died last week, was, *inter alia*, a director of the Chiswick Electric Supply Corporation, Ltd., and the West London and Provincial Electric Supply Co., Ltd.

Wills.—The late Mr. EDWARD D. M. SCRIVENER, managing director of Taylor, Tunnicliff & Co., Ltd., left £39,529 (£28,049 net personalty).

The late Mr. L. W. SPRATT, a director of the Hart Accumulator Co., Ltd., left £151,988 gross and £147,466 net personalty.

New Companies Registered.

Daycomar, Ltd. (211,492).—Private company. Registered February 3rd. Capital, £300 in £1 shares. Objects: To carry on the business of agents and concessionaires for foreign and domestic electrical, radio and optical goods, manufacturers of and dealers in all kinds of kinematograph, phonographic, musical, electrical, mechanical and optical goods, &c. The directors are:—J. S. Martin, 33, Kensington Square, W.8; W. E. L. Day, Hollydene, 15, Cholmeley Park, Highgate, N.6. Solicitors: Kerly, Sons and Karuth, 10-11, Austin Friars, E.C.2. Registered office: 19, Lisle Street, W.C.2.

W. T. Hellaby & Co., Ltd. (211,557).—Private company. Registered February 6th. Capital, £2,000 in £1 shares. Objects: To acquire various business assets and effects from B. French and W. T. Hellaby, and to carry on the business of electricians and electrical contractors, electrical, mechanical, gas, water, heating, lighting, motor and general engineers, &c. The directors are:—B. French, Summer Bank, Bewdley Hill, Kidderminster; W. T. Hellaby, Trevine, Water Orton, Warwickshire. Qualification, 1 share. Solicitor: H. G. Ivens, High Street, Kidderminster. Registered office: 80, Dale End, Birmingham.

Economisers Engineers, Ltd. (211,393).—Private company. Registered January 29th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, boiler makers, brassfounders, ironfounders, tin and copper smiths, &c. The directors are:—G. Austin, 31, Ashton Road, Golborne, near Warrington; G. Coombes, 7, Granville Avenue, Whalley Range, Manchester; H. Ward, 7, Granville Avenue, Whalley Range, Manchester; S. A. Ward, 7, Granville Avenue, Whalley Range, Manchester. Qualification, £1. Solicitor: R. Barrow-Sicree, 86, Cross Street, Manchester. Registered office: 5, Blackfriars Street, Deansgate, Manchester.

T. B. T. Electric Co., Ltd. (211,407).—Private company. Registered January 29th. Capital, £2,000 in £5 shares. Objects: To carry on the business of electrical and mechanical engineers, suppliers, and contractors and manufacturers, exporters, importers and workers of and dealers in electrical, magnetic, galvanic and mechanical machines, &c. The subscribers (each with one share) are:—T. B. Thrige, Odense, Denmark, manufacturer; L. C. Peter, Ornberg, Odense, Denmark, director. T. B. Thrige is permanent governing director. Solicitors: Turner & McCandlish, 3, Raymond Buildings, Gray's Inn, W.C. Registered office: 171, Queen Victoria Street, E.C.4.

Frank Thornton, Ltd. (211,479).—Private company. Registered February 3rd. Capital, £6,000 in 2,250 7½ per cent. cumulative preference and 3,750 ordinary shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in instruments, apparatus, accessories and all materials connected with radio, telegraphy, telephony, and television, and in particular cables, wires, ropes or other substances, accumulators, batteries, &c. The permanent directors are:—Mrs. M. Thornton, address not stated; F. H. Thornton, 167, Rosehill Road, Burnley; H. Thornton, 29, Hogarth Avenue, Burnley; W. H. Thornton, address not stated. Qualification, 150 ordinary shares.

Avalite, Ltd. (211,476).—Private company. Registered February 3rd. Capital, £6,000 in 2,250 7½ per cent. cumulative preference and 3,750 ordinary shares of £1 each. Objects, directors, and all other particulars as Frank Thornton, Ltd., above.

Electric Super Service Co., Ltd. (211,461).—Private company. Registered February 2nd. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians, electrical and mechanical engineers and contractors, &c. The permanent directors are:—Mrs. E. M. Chalmers, 6, St. John's Wood Road, N.W.8; J. W. P. Chalmers, 6, St. John's Wood Road, N.W.8, consulting engineer. Qualification, £100. Registered office: 30, College Street, Dowgate Hill, E.C.4.

Wood, Russell & Co., Ltd. (211,474).—Private company. Registered February 2nd. Capital, £7,000 in £1 shares. Objects: To acquire the business now carried on at 34 and 36, Oxford Street, W., as "Wood, Russell & Co.," and to carry on the business of mechanical, electrical, gas and motor engineers, metal workers, ironfounders, builders, tool makers, water supply engineers, &c. The directors are:—P. N. Wood, Netherheys, South Croydon, boiler manufacturer; and G. D. Russell, Upmeads, Guildford, engineer (both permanent, subject to each holding 2,000 shares). Remuneration of permanent directors, £250 each per annum; of ordinary directors as fixed by the company. Solicitors: Guscotte, Fowler & Cox, 1, York Buildings, Adelphi, W.C.2.

Angel Super Signs (1926), Ltd. (211,508).—Private company. Registered February 4th. Capital, £5,000 in 4,950 ordinary shares of £1 each and 2,000 management shares of 6d. each. Objects: To acquire the business of general sign manufacturers, &c., heretofore carried on by Angel Super Signs, Ltd., and to carry on the business of designers, inventors and manufacturers of and dealers in all kinds of signs, &c. The subscribers (each with one ordinary share) are:—S. H. Cotton, 76, Meath Road, Ilford, Essex, clerk; G. Goodwin, 94, Barry Road, East Dulwich, S.E.22, clerk. The first directors are to be appointed by the subscribers. Qualification, 100 shares of either class. Solicitors: Arthur Hunt & Money, 24, Haymarket, S.W.1.

Official Returns of Electrical Companies.

Ajax Production Engineers, Ltd.—A. G. White, C.A., 14, Old Jewry Chambers, E.C., was appointed receiver on January 28th, 1926, under powers contained in debentures dated January 11th, 1924.

B. M. A. S., Ltd.—J. Collier, I.A., King Street West, Manchester, was appointed receiver and manager on January 29th, 1926, under powers contained in debenture dated February 12th, 1925.

Pressland Electric Supplies, Ltd.—F. W. Stephens, of Salisbury House, London Wall, E.C., was appointed receiver and manager by Order of Court dated January 29th, 1926.

Simms Motor Units (1920), Ltd.—Issue on January 8th, 1926, of £5,000 debentures, part of a series already registered.

C. F. Palmer (London), Ltd.—Charge pursuant to Land Registration Act, 1925, to secure £3,000 charged on 63a, Effra Road, Brixton, S.W., and land adjoining. Holder: C. F. Palmer, 91, Holmdene Road, Herne Hill, S.E.24.

Wallingford and District Electric Supply Co., Ltd.—Debenture dated January 23rd, 1926, to secure £3,500, with further advances up to £4,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: F. J. Kirby, "Riverside," Donnington, near Newbury, Berks.

Hawk Coil Co., Ltd.—Debenture dated January 26th, 1926, to secure £343, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: R. J. Coley, 189, Richmond Road, Kingston-on-Thames.

Specialities (Liverpool), Ltd.—Satisfaction in full on October 28th, 1925, of debenture dated September 28th, 1922, securing £500. (Notice filed January 29th, 1926.)

Woking Electric Supply Co., Ltd.—Satisfaction to the extent of £500 on February 20th, 1915, of debenture stock issued under trust deed dated March 1st, 1926, securing an indefinite amount.

Hewittic Electric Co., Ltd. (89,947).—Capital, £50,000 in £1 shares. Return dated November 18th, 1925. 40,000 shares taken up. £40,000 paid. Mortgages and charges, nil.

East Lancashire Electric Co. (Accrington), Ltd. (140,029). Capital, £3,000 in £1 shares. Return dated August 19th, 1924 (filed February 2nd, 1926). 1,475 shares taken up. £1,335 paid. £150 considered as paid. Mortgages and charges, nil.

Ferryside Electric Supply Co., Ltd. (186,406).—Capital, £1,200 in £1 shares. Return dated January 14th, 1926. 1,000 shares taken up. £1,000 paid. Mortgages and charges, nil.

Western Telegraph Co., Ltd. (6,886C). — Capital, £3,500,000 in £10 shares. Return dated December 10th, 1925. 311,895 shares taken up. £2,339,650 paid. £779,300 considered as paid. Mortgages and charges, £818,675.

Delagoa Bay Development Corporation, Ltd. (76,099).—Capital, £166,300 in 267,400 ordinary shares of 10s. each and 130,400 preference shares of 5s. each. Return dated December 25th, 1925. 267,400 ordinary and 68,400 preference shares taken up. £165,800 paid. £45,000 considered as paid. Mortgages and charges, £245,550.

C. H. Hare & Son, Ltd. (110,911).—Capital, £20,000 in 9,000 ordinary and 11,000 preference shares of £1 each. Return dated December 31st, 1925. 8,000 ordinary and 11,000 preference shares taken up. £12,102 paid on 11,000 preference and 1,102 ordinary shares. £7,498 considered as paid on 7,498 ordinary shares. Mortgages and charges, nil.

Liverpool Electric Cable Co., Ltd. (71,099).—Capital, £30,000 in £1 shares. Return dated December 30th, 1925. All shares taken up. £7,833 paid. £22,167 considered as paid. Mortgages and charges, £24,795.

Mawdsley's, Ltd. (91,783).—Capital, £20,000 in £1 shares. Return dated January 4th, 1926. 18,937 shares taken up. £6,937 paid. £12,000 considered as paid. Mortgages and charges, £6,300.

City of Freetown (Sierra Leone) Electricity Co., Ltd. (138,038).—Capital, £15,000 in £5 shares. Return dated December 31st, 1925. 200 shares taken up. £1,000 paid. Mortgages and charges, nil.

East India Tramways Co., Ltd. (74,457).—Capital, £125,000 in 15,000 preferred, 35,000 ordinary, and 75,000 deferred shares of £1 each. Return dated December 9th, 1925. 7,476 preference, 33,433 ordinary and 75,000 deferred shares taken up. £7,489 paid on 7,476 preference and 7 ordinary shares (including £6 paid on 24 preference shares forfeited). £108,426 considered as paid on 33,426 ordinary and 75,000 deferred shares. Mortgages and charges, nil.

Concordia Electric Wire Co., Ltd. (74,416).—Capital, £100,000 in £1 shares. Return dated November 25th, 1925. 57,319 shares taken up. £57,319 paid. Mortgages and charges, £34,500.

Trent Electric Wire Works, Ltd.—Debenture dated January 23rd, 1926, to secure £1,000, charged on the company's undertaking and property, present and future. Holder: A. M. Gourlay, 24, George Square, Glasgow.

Drake & Gorham, Ltd. (70,275).—Capital, £125,000 in £1 shares. Return dated November 12th, 1925. All shares taken up. £85,000 paid. £40,000 considered as paid. Mortgages and charges, £12,000.

Liskeard Gas and Electricity Co., Ltd.—Particulars filed of £8,000 debentures authorised October 28th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £4,400 (on January 21st, 1926).

Van Raden & Co., Ltd. (78,383).—Capital, £10,000 in £1 shares. Return dated November 30th, 1925. 6,754 shares taken up. £4,654 paid. £2,100 considered as paid. Mortgages and Charges: Mortgage, £1,800; debenture, £1,200; loan, £3,200.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Yorkshire Electric Power Co.

The accounts for 1925 show a net profit, after meeting interest and debenture charges, of £205,016, as compared with £182,764 in 1924. A balance of £46,053 is brought forward, making £251,065, and it is proposed to allocate this amount as follows: Dividend of 6 per cent. (3 per cent. already paid) on the cumulative preference shares, £39,529; dividend of 8 per cent. (3 per cent. already paid) on the ordinary shares, £84,667; to general reserve fund, £40,000; to plant renewals fund, £25,000; writing off expenses of inquiries under the Electricity (Supply) Acts, &c., £6,819; carried forward, £55,051. The report states that the revenue has been maintained in spite of the general trade depression. Substantial economies have been effected, and the prices to consumers have been reduced. The supply of electricity in bulk continues to increase, there having been a number of agreements for new and additional supplies during the year. The addition of the Shipley Urban District Council to the company's system brings the number of distributing undertakings to 57. Following upon the abandonment of the West Riding (Aire and Calder) Electricity District scheme the company has proceeded with its developments in the north-western districts; extensions have been made, and the existing network is being reinforced by a system of 33,000-V mains; the first section, between Thornhill and Halifax, has been completed. A second 12,500-kW turbo-alternator has been installed at the Thornhill station and a portion of the generating plant has already been installed at the Ferrybridge Station. It is expected that the initial installation of 50,000 h.p. will be completed during the current year. In February last year an issue was made of 500,000 ordinary shares of £1 each. To meet the rapid growth of the company's operations the directors recommend that 765,000

six per cent. cumulative preference shares be offered to shareholders forthwith at 21s. each. An extraordinary meeting is to follow the general meeting (at Leeds, February 16th), at which a resolution will be submitted providing for the issue of a further £794,000 as ordinary or preference capital, being the balance of the £4,000,000 authorised by the company's Acts. The shareholders will also be asked in due course to consent to the promotion of a Bill to increase the authorised capital to £6,000,000. The directors propose to give £5,000 to the Leeds University Building Fund by annual payments over a period of years.

Ferguson, Pailin, Ltd. The annual meeting was held on February 4th. Sir Kenneth Crossley (chairman), who presided, said that satisfactory progress had been made during the past year. The dividend remained at the same level, but the reserve had been increased by £10,000, and the value of goodwill and patents had been written down to £1. It was difficult to make a forecast of the company's prospects. The electrical industry was undoubtedly the brightest spot in the home industrial situation, and the Government's electricity scheme (which, he thought, would not cheapen electricity) should bring benefits to the general trading community. They could confidently expect a share in the large amount of orders which would eventually be placed. The extension of the company's Buckley Street works was proceeding satisfactorily, and the factory of the Australian company (which also reported progress) had been extended too.

Siemens Bros. and Co., Ltd. At an extraordinary meeting, held on February 5th, under the chairmanship of Mr. G. Mure Ritchie, a resolution was passed limiting the number of 10 per cent. cumulative preference shares to the number already issued (550 000), and providing for the conversion of the balance (450.000) of these shares into ordinary shares, leaving 950,000 ordinary shares unissued. The chairman explained that fresh capital was needed to finance the increased amount of business which the company was securing, and hoped to secure in the near future. It was proposed to issue 500.000 ordinary shares of £1 each forthwith, and these would be offered exclusively to shareholders in the proportion of one new share to each three held. The shares would be issued at 23s.; they would not participate in the dividend for the past year.

Traction and Power Securities Co., Ltd. The annual meeting of this company was held last week, Mr. H. A. Vernet (chairman) presiding. In presenting the report and accounts, the chairman said that the issued share capital remained at £683,280, while the debenture stock had increased from £300,000 to £365,036. The value of investments at or under cost had risen from £1,062,905 to £1,307,633, and the reserve stood at £200.000 as compared with £166,259 at the end of the preceding year. After referring to the increased net revenue and the raising of the dividend from 11 to 13 per cent., the chairman said that the return to the gold standard had eliminated the baneful uncertainty from sterling exchange. The way was now clear for the remodelling of our internal currency system.

Joseph Lucas, Ltd. At an extraordinary general meeting on February 4th a resolution was approved providing for the raising of the company's capital to £1,100,000 by the creation of 300,000 new shares of £1 each. The chairman, Ald. H. J. Sayer, explained that the new capital was needed in connection with the acquisition of the control of C. A. Vandervell and Co., Ltd., and Rotax (Motor Accessories), Ltd. It was proposed to allot 130,000 of the new shares for the whole of the ordinary shares of Rotax, Ltd. Then 126,500 shares would be issued immediately to the company's own shareholders in the proportion of one new share to each five held at the rate of 65s. per share. The company's principal aim was to standardise automobile electrical equipment as far as possible and improve the " after-sale " service.

Fellows Magneto Co., Ltd. The directors state that for several reasons they are unable to submit completed accounts for the past year. It has been found that while the radio apparatus branch has been making substantial profit, the magneto branch has been working at a loss. There appears to be no prospect of improvement in the latter part of the business and it has been decided to cease manufacturing magnetos and to concentrate upon the production of radio apparatus. A scheme of reconstruction is under consideration. The directors therefore asked the shareholders to adjourn the meeting which was to be held on February 8th until the proposals were ready.

Westinghouse Brake and Saxby Signal Co., Ltd.—The annual meeting was held on February 5th. Lord Southborough, who presided, referred to the many developments which the company had made to meet requirements as they arose, and said that in spite of the depression in the coal industry, many collieries had replaced their old methods of handling coal at the pit decks by the company's electro-pneumatic system. To enable them to furnish additional capital to their Continental associated companies, it was proposed to issue £100,000 of new capital. There would be no difficulty in this as the shareholders had offered to take the whole of the shares.

Oliver Pell Control, Ltd.—A public statement was made in the financial Press last week to comply with Stock Exchange regulations. It stated that the authorised capital is £100,000 in £25,000 eight per cent. cumulative participating shares and 75,000 ordinary shares of £1 each. The former class is entitled to a further participation in profits when the ordinary shares have received 8 per cent., and after receiving 12 per cent. for not fewer than three consecutive years, may be converted into ordinary shares. A dividend of 10 per cent. was paid on both classes of shares in respect of 1924.

Uxbridge and District Electric Supply Co., Ltd.—The accounts for the year ended December 31st last, which are to be presented at the annual meeting on Wednesday next, show a profit of £39,745 and to this is added £1,590 brought forward, making £41,335. Debenture interest, &c., and depreciation absorb £19,950, and it is proposed to pay a dividend of 8 per cent. on the ordinary shares, and to carry forward a balance of £1,385.

City of Buenos Aires Tramways Co. (1904), Ltd.—The balance of net revenue for the year ended December 31st last is £80,838. A final dividend of 1s. 3d. per share (making 5s. for the year) is recommended; £5,604 is to be transferred to the amortisation and general fund, and £13,234 is to be carried forward.

Power Securities Corporation, Ltd.—The report for the past year shows a gross income of £96,412 and an available balance of £77,966. The addition of £8,556 brought forward makes a total of £86,522. It is proposed to transfer £20,000 to reserve, to pay a dividend at the rate of 6½ per cent. on the ordinary shares, and to carry forward £12,944. Meeting: February 17th.

Enfield Cable Works, Ltd.—The directors have decided to offer the balance of the unissued ordinary capital to existing ordinary shareholders in the proportion of one new share, at 45s. per share, for each five ordinary shares at present held. The new shares will rank *pari passu* with the existing ordinary shares for future dividends.

Ever-Ready Co. (Great Britain), Ltd.—At a meeting to be held on March 1st the directors will submit a scheme for the capitalisation of £49,800 of the general reserve, and the issue of £1 ordinary shares to the shareholders in the proportion of one to each five shares held.

Dorman, Long & Co., Ltd.—As briefly reported in our last issue, an offer of £500,000 of 5½ per cent. redeemable first mortgage debenture stock was made last week at the rate of 93½ per cent. The stock is redeemable at par on or before May 1st, 1963, or it may be redeemed at 102 per cent. on or before May 1st, 1943, at three months' notice.

Shropshire, Worcestershire, and Staffordshire Electric Power Co.—A meeting is to be held to-day (Friday) to consider resolutions for the issue of 50,000 existing £1 shares as 6 per cent. preference shares, and of 10,685 " A " ordinary and 42,137 " B " ordinary shares of £1 each.

Tottenham District Light, Heat, and Power Co.—The directors recommend the following dividends for the half-year ended December 31st last:—Preference stocks: at the rate of 5½ and 5 per cent. respectively; " A " stock: at the rate of 7½ per cent.; " B " stock: at the rate of 5½ per cent.

Isle of Thanet Electric Supply Co., Ltd.—The ordinary shares are to receive a dividend of 2½ per cent., the first to be paid. The company proposes to issue 72,000 six per cent. participating preference shares at par to existing shareholders in the proportion of one to five.

London Electric Supply Corporation, Ltd.—The directors have declared the balance of the dividend on the 6 per cent. preference shares for 1925, and a final dividend at the rate of 12 per cent. upon the ordinary shares (less tax) making 10 per cent. for the year.

St. James' & Pall Mall Electric Light Co., Ltd.—A balance dividend of 7s. 6d. per share and a bonus of 5s. are recommended on the ordinary shares, making a total distribution of 17½ per cent. for the year, as in 1924.

Stock Exchange Notice.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Hendon Electric Supply Co., Ltd.—22,212 ordinary shares of £1 each, fully paid, Nos. 73,884 to 96,095.

Yorkshire (West Riding) Electric Tramways Co., Ltd.—The directors recommend the payment of a final dividend of 2½ per cent. on the ordinary shares.

National Gas Engine Co., Ltd.—A dividend of 4 per cent. has been declared on the ordinary shares for the past year.

Stocks and Shares.

MONDAY EVENING.

BUSINESS in the Stock Exchange is proceeding very quietly. Members and clients are alike becoming restive under the enforced restfulness that stands in such marked contrast to the feverish activity which prevailed up to the end of last year. The rending of the rubber boom has cost many people money, and the stream of new issues tends to divert attention from older stocks and shares. The Stock Exchange is, in a word, quiescent. It demands a detached mind to acknowledge the

logic of the present position as being only what might have been expected after nine months of active and excited markets. Cable equipment issues have parted with some of their recent exuberance, though prices are well maintained, and the declines are modest as compared with the previous substantial rises in a good many prices.

The London Electric Supply Corporation announces a final dividend for 1925, making 10 per cent. for the year, the same as that of the previous twelve months. The price of the shares remains at 32s., to which it fell last week, and the return on the money invested in the shares at to-day's price is 6¼ per cent. Chelseas are dull at 2½. Urban ordinary went back to 19s. 6d. There is a good deal of quiet buying of Whitehall Electric Investment 7½ per cent. preference, which shares can still be obtained at their par price of 20s. The chairman of the Gas Light & Coke Company protested, at the recent meeting, that the Government is unduly favouring electricity; he referred more particularly, of course, to the electrical expansion scheme which is now proposed. No doubt the provision of fresh capital for development of the scheme would be assisted by the extension of the Trade Facilities Act to the financing part of the plan.

Underground Electric Railways of London are a good spot. The £10 shares have risen to 2½ and the income bonds are close to 100. The Underground group declares its dividends on the Thursday in this week. Districts, however, are ½ lower at 47½. Speculation is taking mild interest in some of the London tramway issues. London and Suburban preference are up 1s. to 4s. 6d. London United Tramways 4 per cent. debenture gained 4½ points at 45, and the Company's ordinary shares strengthened to 3s. The market in these has been dormant for so long a time that curiosity is expressed as to what may be the possible reason for this revival of attention. The recent report upon the results of the L.C.C. Tramways was not such as to encourage optimism, and this consideration adds to the interest attached to the rises in tramway shares.

The dispute, over wages, between the Underground Railways and the Electrical Trades Union has had no effect so far upon prices of stocks and shares in companies that might be affected if the trouble should become serious.

Metropolitan-Vickers ordinary have dropped back to 28s., but General Electrics gained a trifle, to 31s. 6d., upon the formation of the Siemens & General Electric Railway Signal Company. Both companies have carried on separate railway signalling departments, but these branches are now to be amalgamated into the new undertaking. Details of the latter are expected to be made public very shortly. The Yorkshire Electric Power Company is about to offer 765,000 6 per cent. cumulative preference shares of £1 each, the issue price of which will be a guinea. The company's profits for last year came out at £205,000, an advance of £22,000 over those of 1924, and the dividend on the ordinary shares is maintained at 8 per cent. upon the larger capital. The existing 6 per cent. preference stand at 22s. 6d. in the market, this price carrying the dividend of 7 1/5d. per share. The ordinary, at 31s., yield £5 3s. per cent. on the money.

Another company which is raising new capital is the Enfield Cable Works, in which proprietors of the existing ordinary shares are to be offered one new share at 45s. for every five shares at present held. As the latter stand about 69s. ex dividend, the new issue offers a pleasant bonus. It may be pointed out that shareholders, whether they care to take up their allotments or not, should on no account miss the opportunity of securing the benefit which this new issue affords them, for the rights will be readily saleable in the Stock Exchange. Many people throw away papers that invite them to subscribe more capital, and by so doing they present "money for nothing" to those who are only too glad of the chance to take up new shares, offered at bonus prices, which are not subscribed by the original allottees.

The Isle of Thanet Electric Supply Company proposes to issue 72,000 participating 6 per cent. preference shares at par to all shareholders; one new share being offered in respect of every five old shares held. The Company has declared its first dividend on the ordinary shares, and at the rate of 2½ per cent. actual. The price of the latter is 17s. middle. The new preference will participate with the ordinary after the latter shall have received 6 per cent. dividend.

The Brazilian Traction boom continued further, the price being run up, on American-Canadian buying, to 98. Around this figure a lot of shares came in, and reaction carried back the quotation to 94½ ex dividend, at which there was still left a rise of 3½ points on the week. Mexican Light & Power Common and preferred are better, upon some vague, and quite improbable, rumour of early dividend-resumption on the former. Yorkshire (West Riding) Trams have gone back to 17s. 6d. Cable and telephone descriptions are uninteresting. Automatic Telephones at 2⅛ have lost 1/16; so have Orientals at 2½. The wireless shares are neglected because of the uncertainty felt as to what may be the outcome of the conferences between the Government and the wireless operators in connection with the strike of the latter.

India Rubber shares are up to 25s. Telegraph Constructions put on a further 10s. at 28½. The other changes in this group have been already mentioned. Rubber shares have retreated well into the background of popular favour. Business in them runs on humdrum and unexciting lines, the price of the produce, at 2s. 10d. per lb., being 1s. 10d. below the highest level reached during the boom period before Christmas.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923	Dividend. 1924.	Price Feb. 8, 1926.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	18	14	63/3	—	4 8 7
Brompton Ordinary	1	10	10	12½	—	*5 14 3
Charing Cross Ordinary	1	14½	15	47/-	—	6 7 8
do. do. 4½ Pref. ...	1	4	4½	17/- xd	—	5 5 11
Chelsea	1	12	12	2½	—1/32	5 12 11
City of London	1	15	15	47/-	—	6 7 8
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	30/6	—	5 4 11
County of London	1	15	15	58/3	—	5 3 1
do. do. 6 % Pref.... ...	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	7	24/-	—	5 16 8
do. 7% Pref.	1	6	7	22/6	—	6 4 8
Elec. Supply Corporation	1	10	10	32/6	—	6 3 0
Kensington Ordinary	5	14	15	14½	—	5 5 3
Lancs. Light and Power	1	7½	7½	27/-	+6d.	5 11 1
London Electric	1	10	10	32/-	—	6 5 0
do. do. 6% Pref.	5	6	6	5 7/32	—	5 7 10
Metropolitan	1	10	11	39/6	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	23/9	—	5 1 1
Newcastle-on-Tyne Ordinary ...	1	6	7	23/9	—	5 17 11
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	24/6	—	5 14 8
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.... ...	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	16½	—	5 8 3
South London...	1	15	15	2 7/32	—	5 17 1
South Metropolitan Pref.	1	7	7	1 7/32	—	5 6 8
Urban Ordinary	1	4	4	19/6	—6d.	4 2 1
do. 6% Pref.	1	6	6	1	—	6 0 0
Westminster Ordinary	1	15	15	46/3	—	6 9 6
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	31/-	—	5 3 0

HOME RAILS.

Central London Ord. Assented ...	Stock	4	4	69	—	5 16 0
Metropolitan	,,	4	5	69	—	7 4 11
do. District	,,	2½	2½	47½	—½	7 7 4
Underground Electric Ordinary ...	10	Nil	Nil	2½	+¼	Nil
do. do. "A" ...	1/-	Nil	Nil	7/8	—	Nil
do. do. Income ...	Bonds	6	6	99	—	*6 1 2

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	102	—	5 17 8
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	3	6	52/6	—1/3	2 5 8
Chili Telephone	5	6	5	6⅞	—	*3 18 5
Cuba Sub. Ord.	10	5	5	6⅞	—	7 8 2
Eastern Extension	10	10	10	18	—	*5 11 1
Eastern Tel. Ord.	Stock	10	10	177½	+1	*5 12 8
Globe Tel. and T. Ord.	10	10	10	18½	—	*5 8 1
do. do. Pref.	10	6	6	11	—	5 8 4
Great Northern Tel....	10	22	22	32	—	6 17 6
Indo-European	25	7	8½	45½	—	*4 13 5
Marconi...		10	10	1½	—	8 0 0
Marconi Marine	1	10	7½	¾	—	8 11 6
Oriental Telephone Ord.	1	12	12	2½	—1/32	*5 19 11
United R. Plate Tel....	5	8	8	7 1/32	—	5 2 7
Western Telegraph	10	10	10	17⅛	—¼	*5 11 11

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3 5/16	—1/32	8 6 0
do. do. 2nd Pref. ...	5	6	6	3 5/16	—	9 8 2
do. do. 5% Deb. ...	Stock	5	5	73½	—	6 16 3
British Electric Traction Ord. ...	,,	6	6	117½	—	5 2 2
do. do. 6%Pref. ...	,,	6	6	106	+1	5 13 2
Brazil Traction	100	4	4	94½xd	+3½	4 4 8
Brit. Columbia Elec. Rly. Pcs. ...	Stock	5	5	84½	+1	5 18
do. do. Preferred ...	,,	96/-	96/-	103½	+1	*4 12 0
do. do. Deferred ...	,,	129/5	129/5	128	—	*5 1 7
do. do. Deb. ...	,,	4½	4½	79	+2	5 7 7
London & Sub. Trac. 5% Pref. ...	1	2½	Nil	4/6	+1	Nil
London United Tram. Deb. ...	Stock	4	4	45½	+4½	8 8 4
Mexico Trams, 5% Bonds	—	5	5	62½	—	8 0 0
Mexican Light Common	100	Nil	Nil	32½	+1	Nil
do. Pref.	100	Nil	Nil	62½	+1	Nil
do. 1st Bonds	—	5	5	69½	—1	7 3 11
Yorkshire (West Riding)	1	5	—	17/6	—1/3	5 14 3

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	12	12	2½	—	*4 11 5
British Aluminium Ord.	1	5	10	37/6	—	5 6 8
British Elec. Transformer Pref. ...	1	Nil	7½	20/9	—	6 14 11
British Insulated Ord.	1	15	15	3 1/32	—	4 17 11
Brush Ord.	1	10	10	1 1/32	—	6 19 2
Callenders	1	15	15	3½	—	4 5 9
do. 6½% Pref....	1	6½	6½	22/6	—	5 15 7
Crompton Ord.	1	Nil	Nil	16/9	—	... ...
Edison-Swan	4/-	10	10	9/-	—	4 8 11
do. 5% Deb.	Stock	5	5	83	—	6 0 6
Electric Construction	1	10	10	34/6	—	5 16 0
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	20/3	—	4 18 9
do. do. Pref.	1	6	6	20/6	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	24/-	—	5 8 4
,, Ord.	1	5	7½	31/6	+6d.	4 15 3
Henley	1	15	16	3½	—	4 6 10
do. 4½% Pref-	5	4½	4½	4½	—	5 6 0
India-Rubber...	1	5	5	1	+1/32	*4 0 0
Johnson & Phillips	1	10	10	21½	—	3 8 3
Met.-Vickers, Ord.	1	8	8	28/-	—1/3	5 14 4
do. Pref.	2	8	8	2½	—	6 14 9
Siemens Ord.	1	—	7½	33/9	—	4 8 11
Telegraph Construction	12	20	10	28½	+½	*4 4 3

*Dividends paid free of Income Tax.

The Interconnection of Power Systems.

The Successful "Loose-linking" of Large Power Stations in America.

IN view of the Government's proposed method of reorganising the system on which electricity is generated and transmitted to distributing centres in this country, it will be instructive to consider a method that has been successfully applied in the United States to minimise system disturbances and reduce the duty that is expected of oil switches without sacrificing flexibility and economy of operation.

"Like a radio vacuum tube on the verge of oscillation—highly efficient, but damnably unstable"—is an expression which has been used facetiously, but which, nevertheless, has a sober application to solidly interconnected concentrated sources of power. In connection with an example of what has actually been accomplished in America, Mr. Alex. Dow, president of the Detroit Edison Co., was interviewed recently by a representative of the *Electrical World* regarding what he terms the "loose-linking" of his system, which has been gradually perfected since 1920, involving a generating capacity of over 500,000 kW and a mass of 24,000-volt cables. Fig. 1 indicates the method followed.

"What is the distinctive feature of this system?" Mr. Dow was asked. "Our system is not a closely connected unity served by several power houses," he replied. "Instead, I like to think of it as several contiguous areas having their own sufficient power houses interlinked primarily for mutual assistance and secondarily for the attainment of maximum economy. 'Loose-linking' is not new; continually increasing demands and generating capacity, together with the close knitting of the transmission system, forced us into it in 1920: the whole connected capacity was ever ready to spill an immense amount of energy into a fault whenever one developed. No company can afford to allow conditions to continue that are favourable to system-wide disturbances.

"Economy is subordinate to the first purposes of interlinking — namely, mutual assistance. Therefore, the manner and extent of interlinking should be such as will permit the transfer of energy between contiguous areas when needed and to the amount required by any controllable operating disturbance affecting the area which needs assistance. Interlinking should not be so tight that disturbances of the service that are temporarily uncontrollable will extend from the area in which they originate into contiguous areas. In other words, all of the ordinary chances of trouble, such as the disablement of a turbo-generator set, or the loss of an important line, should automatically bring sufficient assistance into the disturbed area from other areas, but an uncontrolled disturbance (some vicious short circuit causing generators and synchronous machinery to break out of step) should not be aggravated by having the energy of more than one area dumped into it; nor should such a disturbance be permitted to extend into other areas than that in which it originates. The foregoing requirements can be met by limiting the number of points at which energy may pass from one area to another and by providing adequate automatic switchgear at each of these points.

"The system operator, in consultation with the production department, assigns to each power house the amount of load it is to carry from hour to hour. Each large change of assigned duty will necessitate relimitation of the areas of supply, and the number and locality of the interlinkages in use at any time must be varied in consonance with the duty assigned for the time being to each power plant. The system operator must not only prescribe the points of interlinking and the normal carrying capacity of each interlinkage, but must in the final refinement prescribe the overload at which the interlinkage will automatically disconnect.

"One important requirement is that when a power house (or power area) breaks loose from the others, it should carry with it a proportion of the total load corresponding to that proportion of the total load which was assigned to it for the time being. If it carries too much load with it, a needlessly large amount of service will be affected by the disturbance; if it carries too little load with it, the other power houses will be temporarily overloaded. It is desirable that the interlinking of an area should not be effected with more than two other areas.

"At the Connors Creek plant the ring bus is split into two main sections, with generators and lines on each, resulting in two separate buses and transmission line groups. When these lines were tied together only at the sub-stations, the maximum short-circuit current at the Connors Creek plant was cut down considerably, but the current values in the sub-stations were not, because lines emanating from both buses were joined in the sub-stations. However, lines to the nearest sub-stations are being cut over at the power source, so that all lines to the same sub-station will be on the same main bus, but on different bus sections. This method of operating has been found satisfactory and separation of the station buses may eventually be followed by separating, or loose-linking, the steam system for similar reasons of reliability.

"While it is not the case now," pointed out Mr. Dow, "we are avoiding the installation of switches within large power houses to prevent switch wrecks putting the stations out of service. Interlinkage switching stations should also be separated from distributing sub-stations and should be located and built in due sequence in advance of necessity. The switchgear should have large excess capacity, or at least provision should be made to substitute quickly switches of larger capacity when conditions change.

"The 120,000-volt double-circuit loop around the outskirts of Detroit from Marysville to Trenton Channel primarily feeds the outskirts of Detroit without running high-voltage large-capacity cables from the generating plants themselves, but it also serves as a tie between our two most economical plants on the extreme opposite sides of our system. This loop, consisting of two parallel circuits each nearly 120 miles long, can be divided into approximately three equal parts by two sectionalising stations and is also tied at certain points, designated by the system operator, with the city cable system.

"Loose-linking represents only a partial separation of the system; all generators operate in parallel on the main system and carry the allotments of load as determined by their best efficiency. Although instantaneous exchange of power between two adjacent plants is normally limited to the one tie, considerably more load can be transferred between adjacent areas by different switching combinations at the various interlinkage stations. It has been possible to maintain the system economy as high as with the customary solid interconnection between stations, but without the possibility of serious derangement of the whole system which is thereby permitted.

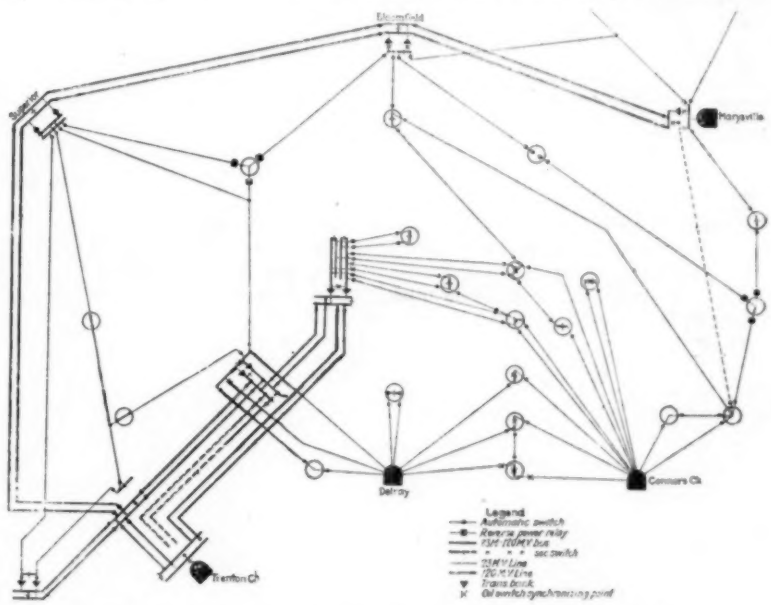


Fig. 1.—Method of "Loose-Linking" the Detroit Edison Power System.

"No more reserve capacity is required than in a system that is closely interconnected all of the time. Even if it were required, it is not so expensive to provide as many people think. The cheapest form is an oversize generator driven by a turbine with a manual-control bypass valve admitting h.p. steam to an intermediate stage, safeguarded by the governor, of course. The economy during emergency operation would be reduced, but would be more than offset by the saving in fixed charges on reserve capacity furnished in the usual way. Engineers are worrying too much over fixed charges when spending a little more than is technically economical may mean the difference between a desirable, and a merely satisfactory, or poor, service. Five per cent. increase in capital invested in a power house would hardly be noticeable in the cost of rendering service, and if spending this money produces more reliable service, it is an inexpensive way of securing better public relations.

"Advantages gained by loose-linking are greater reliability and stability of operation than we obtained five years ago, despite the fact that loads have increased in size and number and generating capacity has been augmented by two large

stations at Marysville and Trenton Channel. In addition, we have minimised circuit breaker duties and, consequently, the possibility of breaker failure, with possible equipment damage and most certain service interruption. Short-circuit currents were assuming values which no available circuit breakers could handle safely. Sustained short-circuit currents to any point of the system have been limited; in sub-stations the reductions vary from 15 to 55 per cent.; at Delray the reduction has been 38 per cent., and at Connors Creek about 29 per cent. with a closed ring bus (41 per cent. with a sectionalised bus). The reduction, even though the breakers disconnect the trouble promptly, also means lighter bumps on the system and less disturbance of the connected synchronous machinery; bumps are confined more to one generating plant and its area, and are not so keenly felt in the other areas. Isolation of trouble and prevention of promiscuous secondary disturbances enable a better diagnosis to be made and a quicker recovery to normal operation."

Mr. Dow does not contend that loose-linking supplants the necessity of reactors, or other methods that may be adopted. He recognises the desirability of greater certainty of relay action than is now obtainable. Nevertheless, he confidently believes that loose-linking can be applied to any concentrated power sources, with benefits equal to those he has obtained. The location of the plant and its size are less restricted than with solid interconnection.

Power Factor and Tariffs.

Types of Correction Plant and a New Three-part Tariff.

(*Abstracts of papers read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

AT the meeting of the Institution on February 4th, two papers on the above subject were submitted, an excellent résumé of the first one (by Mr. E. V. Clark, who is in Australia) being read by Mr. E. L. Hill. The paper, which will be abstracted next week, contends that, although it has no energy content, the wattless component of electricity supplied to consumers has a real value to them, and in many cases entails a real running cost to the undertaking; that where low power factor is seriously perturbing a supply undertaking, a rational tariff should include a charge for wattless component, and that a charge based on the kVA-hours of lagging wattless component consumed, with an equal rebate for leading wattless component taken at time of load, is a reasonable basis for such charge, although not absolutely ideal; and finally, that the adoption of a three-part tariff embodying such a charge may be arranged without undue complication of metering methods, and without entailing perplexity in the minds of non-technical users of power.

The second paper, an abstract of which follows below, was written with the aim of following up the first one. It summarises the principal types of apparatus employed for the improvement of power factor, and describes the modern static condenser and also types of power-factor rectifying plant that have been developed during the past three years. The second part of the paper outlines various forms of power-factor tariff in force in Great Britain, and systems of metering employed in conjunction therewith are briefly dealt with.

Power Factor Improvement.

By E. W. DOREY, A.M.I.E.E.—*Abstract.*

Since Dr. G. Kapp's paper in 1922 there has been no addition to the types of auto-synchronous and synchronous motors therein described. The rotary condenser still finds favour in Great Britain, but it has a comparatively high loss, usually not less than 5 per cent., and may be as much as 7 per cent.; when this loss is capitalised, the rotary condenser, under the conditions ruling in Great Britain where power is mainly generated from coal, compares very unfavourably with other forms of p.f.-improving apparatus, such as static condensers. To take as an example a 1,000-kVA equipment, the difference in losses between static and rotary condensers would be of the order of at least 4 per cent. With a 12-hour working day, 300 days per annum, this would be the equivalent of 144,000 units lost, and at 1d. per unit sold this is approximately £600 per annum. If this difference be capitalised it will show the static condenser installation to be by far the more economical.

The adoption of p.f. tariffs has compelled designers to produce an induction motor with a very high inherent power factor, and the introduction of a.c. motors fitted with ball and roller bearings has assisted greatly; when the wear that is attendant upon the use of the journal bearing has not to be contended with, it is possible to use a much smaller air-gap.

Oil-immersed electrostatic condensers are manufactured in Great Britain principally by Messrs. British Insulated and Helsby Cables, Ltd., and the Telegraph Condenser Co., Ltd. They consist primarily of plates comprising a length of paper coated with tin under the Mansbridge process; the plates are separated by the requisite thicknesses of paper used as the dielectric, the number of thicknesses being dependent upon the voltage applied across the terminals of the unit. Generally speaking, each unit of the condenser has a capacity of approximately 1 microfarad, but this may be greater or less according to the special conditions obtaining on the circuit. The two principal makers assemble the units in frames, the frames being fixed into boiler-plate tanks and completely oil-filled. The modern oil-immersed static condenser is a very reliable and efficient apparatus.

A good deal has been said about the risk of resonance due to the connection of static condensers, but over many years no difficulty whatever has been experienced. It is not claimed that resonance may not occur under certain exceptional conditions, but under the ordinary industrial conditions prevailing, not only in Great Britain, but overseas, experience shows that resonance does not occur.

The static condenser, as built in Great Britain, is essentially a medium-pressure apparatus, the most economical voltage being about 600, but condensers have been, and are, built for direct connection to supplies up to 3,300 volts. Only in exceptional cases is it cheaper to supply a h.p. condenser, and the saving is not even then more than 10 to 15 per cent. of the overall cost of the equipment. The right place to put the condenser is in the l.p. circuit, as by so doing the improvement will be effected as far as possible out on the distribution network, and in practice the call for h.p. condensers is very small.

A case has been reported from overseas of a British-made 100-kVA, 3,300-volt, outdoor condenser which, for the purpose of test and experience generally, is connected direct across the h.p. overhead transmission line without any protection whatever, and is therefore subject to every kick and surge on the system. Nearly 12 months have elapsed since the condenser was first connected and it continues to give every satisfaction. This should be sufficient evidence to show that the static condenser does not in reality possess the attributes of frailty so frequently ascribed to it.

A comparatively new development is the l.p. pole-type condenser connected direct across pole-type step-down transformers, this application being particularly useful in the case of rural distribution. British-made condensers of this type have been working for some considerable time in New Zealand, and it is reported by the engineer of one Power Board that, from the point of view of improved regulation only, the installation was worth while. In this case, however, the annual saving effected is sufficient to repay about 70 per cent. of the cost of the equipment, and to this has to be added the increase in the useful output of the transformer, as the condenser being connected on the low-pressure side of the step-down transformer unloads the transformer of wattless current, and for every 2 kVA of condenser capacity under industrial conditions the load on the transformer will be reduced by approximately 1 kVA.

The efficiency of the static condenser is 99.7 per cent., so that the losses are almost negligible. A bank of directly-connected condensers having an output of 1,000 kVA would have a loss of only 3 kW. Where auto-transformers are used for stepping up the voltage from that of the supply to the most economical voltage for the condenser, the auto-transformer losses have to be added, but the overall losses of large complete equipments for the usual industrial voltages may be taken to be between 1 and 1.5 per cent. of the output in kilovolt-amperes.

With the two makes referred to, the type of unit used in either case would be the same; therefore, at 440 volts the condenser would require to be 86 per cent. larger and approximately 80 per cent. more costly than at 600 volts. To overcome this it is usual to step up the voltage by means of an auto-transformer to the most economical voltage for the condenser (in the above case, 440 to 600 volts). The auto-transformer is comparatively inexpensive and the overall reduction in price for the complete equipment is very considerable.

Where new step-down transformers are necessary, either as separate units or to bank with existing transformers, and in addition a condenser is required, it is possible to overwind the secondary of the transformer to give the most economical voltage for the condenser. By this means the auto-transformer is avoided and the whole scheme simplified, a considerable monetary saving being effected.

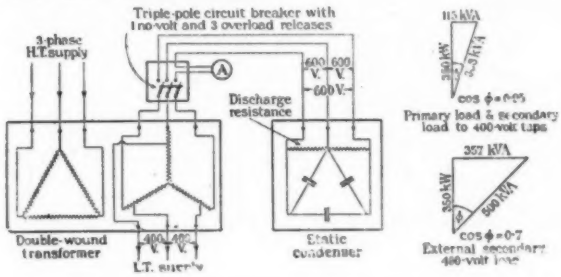
Fig. 1 shows the loading and phase angle of the various circuits of an overwound-connected condenser equipment.

Where a supply undertaking is faced with bad voltage regulation and low power factor, whether or not a power-factor tariff is in force, it should be possible to improve matters considerably by connecting direct across the l.p. busbars in each sub-station feeding industrial load sufficient condenser capacity to neutralise the magnetisation current of the whole bank.

A great advantage of the static condenser is its mobility; it can be put at the end of an over-loaded circuit, but if later on this circuit is underloaded, it can be moved to another position as may be required. The price per kVA of condenser capacity varies according to voltage, frequency, and climatic conditions, but, taking conditions in the United Kingdom and a three-phase 50-cycle supply at from 400 to 440 volts, the cost of equipment ranging in size from 100 to 300 kVA varies

approximately from £3 5s. to £2 9s. per kVA, a good average figure being, say, £3 2s. per kVA.

The "phase-advancer" is an a.c. exciter to improve the p.f. of a slip-ring induction motor. These exciters literally short-circuit the slip-rings and inject the necessary leading current into the rotor. Phase-advancers have been used extensively on the Continent, but do not appear to have found much favour in this country.



Load on primary = 368 kVA (resultant of two secondary loads).
External load on secondary at 40 -volt tappings = 500 kVA.
Internal load on secondary between neutral and 400-volt tappings =368 kVA (resultant of two secondary loads).
Load on 400-600 volt winding = 300 kVA (condenser load).

Fig. 1.—Loading and Phase Angle of Overwound Equipment.

A comparatively new type of induction motor capable of running at a high power factor at all loads is the so-called compensated induction motor. Among machines of this type is one built by the British Thomson-Houston Co., Ltd., with the trade name of "No Lag." Machines of this type can be built in sizes up to 200 or 300 h.p. for either two- or three-phase circuits up to 600 volts at any commercial frequency. The motor has a commutator which enables the phase of the secondary to be controlled and, hence, the power factor to be corrected. The kVA handled by the commutator is very small, and so it is very small with simple and inexpensive brushgear. This motor is as simple to operate as a plain induction motor, and standard starters as used for the slip-ring-type induction motor can usually be used. It is capable of giving as large a torque at starting as the slip-ring induction motor.

Fig. 2 is a typical power-factor curve of a 17½-h.p., 1,000-r.p.m., 415-V, 50-cycle "No Lag" motor, and, if desired, a leading p.f. of 90 per cent. at full load can be obtained, and in certain cases an even greater leading power factor. Fig. 3 shows the speed and efficiency characteristics which approximate to those of the plain induction motor. It is an asynchronous motor, so that for applications where a slight drop in speed with increasing load is necessary, or desirable, it is admirably suited. As no separate exciter or expensive switchgear is necessary this motor is less expensive than the auto-synchronous motor, and it can be built in small sizes of the end-shield type.

It is reasonable to assume that the time is not very far distant when the great majority of undertakings supplying alternating current will adopt some form of power-factor tariff. The p.f. tariffs in force in Great Britain may be divided as follows:—

Class (A).—A two-part tariff incorporating a fixed charge per month, per quarter, or per annum, per kVA of maximum demand, with a running charge or flat rate per unit consumed.

Class (B).—A tariff which may be either of the two-part type based on the kW demand and the running charge per unit, or a one-part tariff based on units consumed only; in both cases, however, subject to a percentage decrease or increase, bonus/penalty, depending upon the power factor of the load. The tariffs divide themselves into those which give a bonus for reduction in kVA demand only and those which give a bonus on the total bill, that is, the capital charges and running charges. The majority of electricity supply undertakings are favouring the kVA demand tariff, owing to its simplicity; a satisfactory meter can be provided to record the kVA demand and an explanation of the term "power factor" is not involved. In the case of Class (B) tariffs, difficulties are met with in getting the consumer to put in plant for the improvement of power factor, the chief of which are as follows:—

(1) In the case of an overall bonus/penalty on the power-factor supply bill, a consumer with a relatively high load factor has a large supply bill compared with the low-load-factor consumer, both running with the same maximum demand and power factor. To improve the p.f. would require the same condenser capacity in each case, but the consumer with high load factor would get a proportionately greater saving than the one with low, and the inequity of this type of power-factor tariff is very evident.

(2) In those cases where a bonus is given for improvement of power factor above definite limits, such as 85 and 90 per cent., the objections referred to in (1) above also apply, but in addition there is the serious objection that the consumer with, say, 83 per cent. p.f. can, with a comparatively small condenser, correct to either 85 or 90 per cent. and obtain the bonus, but the consumer with a very low p.f., say 50 per cent., would have to correct right up the scale to, say, 84 per cent., without getting a penny piece by way of bonus: in other words, the low-p.f. consumer would have to put in such large condenser capacity that in the majority of cases it would not pay.

(3) This type of tariff involves an explanation of the term "power factor," and it will be generally agreed that the less explanation one has to give to the consumer the better.

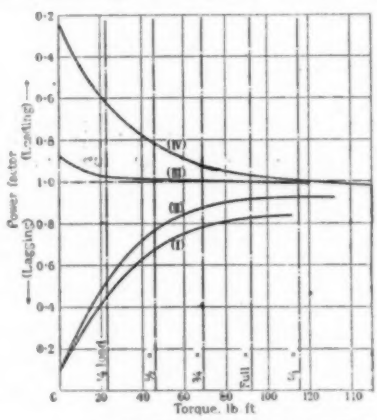
The correction of low power factor is one of the few important economies remaining to be effected, and there seems little doubt that, converted into £ s. d., low power factor is resulting in enormous losses to electricity supply undertakings, not only as regards capital charges, but also running charges, and the losses are being borne by the industrial user of a.c. power. Admittedly, the consumer is responsible for the power factor of the load, but it behoves every undertaking supplying a.c. power to make it worth while for the consumer to raise his power factor and thereby effect a general reduction in electricity charges, thus ultimately benefiting industry in general.

Discussion in London.

Mr. R. O. KAPP opened the discussion by remarking that so much had been written and said about the subject that one would have thought there was nothing left to discuss; both the papers before them that evening, however, contained something new and important. There were two aspects of tariff making: one was the accountant's point of view based on detail costing, and the other was the salesman's point of view, who had to consider many points which the accountant could neglect, including the mentality of the consumer, &c. With regard to Mr. Clark's paper, it did not sufficiently emphasise this salesman's point of view. Bad power factor meant bad voltage regulation, particularly on systems that included many transformers and overhead lines, especially at low pressure. The analogy the author drew from the sale of concentrated and weak sulphuric acid was a very important point. The framing of tariffs should be done with due consideration for the "ignorance" of the consumer; for example, if a bonus were offered the consumer would probably "understand" a tariff much more readily than if a penalty were imposed. A 3-part tariff assumed that the 2-part tariff was based on accurate cost accounting with the introduction of a refinement, but was the average 2-part tariff a true accountant's tariff? The allocation of cost was not easy, and a close approximation to true costing seemed to be hardly possible. Concerning Mr. Dorey's paper, he (the speaker) could confirm the statement that the risk of resonance due to the employment of condensers was by no means serious. The author's details of pole-type condensers were very welcome, as such appliances should have a big field in front of them for rural electrification. A.c. fans had a bad power factor, and he had once had to consider the correction of such a load, but the cost had been prohibitive. Could the author say whether condenser correction would be possible now, either for individual fans, or for groups of fans?

Mr. S. H. HART pointed out the advantages of using motors of a good design and running induction machinery at as high a speed as possible to improve the power factor. Large consumers could be dealt with by means of a tariff, but the small consumer would have to be provided for in co-operation with the supply authority.

Mr. W. B. WOODHOUSE, speaking as a supply undertaker, said that idle current did cost the supplier something, and therefore the consumer should pay for it. Small consumers could not be expected to carry out p.f. correction; the supply authority could do it and charge the consumer accordingly. Large consumers, however, could do their own correction, and they should be offered a suitable tariff. In one case he knew of a saving of £2,000 had resulted in one year and in another case the saving had been £6,000, the inducement to correct



(I) Power factor as induction motor.
(II) Power factor as compensated induction motor; min. compensation.
(III) Power factor as compensated induction motor; unity power factor.
(IV) Power factor as compensated induction motor; max. compensation.

Fig. 2.—Power Factor Curves of Compensated Induction Motor.

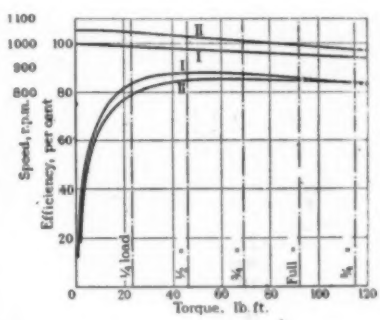


Fig. 3.—Efficiency and Speed Curves of Compensated Induction Motor.

being a charge on the kVA basis. The method of charging, however, needed some consideration: Should the charge be based on the sum of the idle ampere-hours, or on the idle current at the time of maximum demand? The latter was perhaps nearer the fact, but there was no really suitable meter for such a system at present.

Mr. R. A. CHATTOCK (president) pointed out that p.f. correction depended on the nature of the supply that had to be given. On a d.c. system, for instance, rotary converters at the most important parts of the network would assist materially in keeping the main trunk lines well loaded up, which was a necessity. Offering discount as an inducement would not pay in Birmingham at present. Regarding the use of condensers in rural districts, it should not be forgotten that if a condenser were left in a circuit at night, when the load was off, it would result in the supply network having a serious leading factor and introduce difficulty in connection with voltage regulation.

Mr. L. W. MIGOTTI said he came from abroad (South America) and he claimed to supply a large amount of energy, but not one of his consumers would take the slightest interest in power factor, except perhaps the British railway officials, who, however, were not yet being supplied. Nevertheless, they had a power factor of from 0.93 to 0.97 at the peak load, which was the most important time. Their method was to estimate what they expected to receive from each consumer and charge him accordingly. In general, the consumer should not be worried about power factor unless he was fully fitted to understand the subject. Correction, where necessary, should be carried out by the supply authority with the help of the designers of machinery.

Mr. A. H. BENNETT thought that Mr. Clark had tried to prove on paper something that was not really necessary. All that was required could be accomplished by means of a 2-part tariff. They never attempted to explain power factor to a consumer, but they did show him what it would mean to him in £ s. d., and at the same time offered a condenser on the hire-purchase system, which was usually accepted. The public did not want electricity, but energy, and it was up to the suppliers to give it them. It would be worth the consumer's while to improve his power factor to something over 0.9.

Mr. P. M. BAKER expressed the opinion that any tariff which required the consumer to understand power factor was quite hopeless.

Mr. JOHNSON knew of some consumers charged on the kW basis who had a power factor of 0.4. The whole trouble was due to induction motors being allowed to work at one-third load. Manufacturing costs and other such considerations limited the possibility of reducing the air gap of motors, and static condensers could not be used when the load was variable, whereas motors could be so used. The Clyde Valley case was due to the peculiar geographical position of the generating stations. The use of auto-synchronous motors was a commercial proposition where other means were not justified, and such machines had now been applied to every class of industrial use. Static condensers had limitations which were very soon reached.

Mr. H. S. ELLIS drew the author's attention to an instrument known as the "Maxigraph," which he had used and found quite reliable. It was provided with a recorder as well as an indicator and gave the p.f. record on a basis of time.

Mr. E. W. DOREY, in reply, said that small condensers could now be supplied with fan motors and they should have a very wide application in the tropics. In the case of bulk correction a condenser might give a leading p.f. when only two or three of the fans were in use, so that individual correction might be preferable. Squirrel-cage motors were most reliable and would be efficient when installed in combination with static condensers, if the cost proved to be suitable, but each case must be considered on its merits. He often wondered why supply authorities did not do more correction themselves; the chief reason was probably due to voltage regulation problems, because when the consumer carried out the correction his condensers were switched off as the load decreased. A kVA-demand instrument was available, and it was a very reliable meter, although expensive. It was interesting to hear that although Birmingham and Manchester were well situated as regarded power factor, they offered inducements to consumers to correct their power factor. Automatic switchgear might be devised before long to cut out the condensers as the load fell, otherwise it might be advisable to split up condenser capacity. Where kVA-demand tariffs were in use, it was very much easier to induce consumers to install p.f. correcting apparatus.

A Large Frequency-changer—A frequency-changer, said to be the largest piece of electrical machinery of its kind ever designed, weighing more than 600 tons, has been ordered by the Philadelphia Electric Company from the Westinghouse Electric and Manufacturing Company. The contract also calls for the delivery of eight oil circuit breakers for a voltage of 73,000 V and a rupturing capacity of 1,500,000 kVA. The machine will be installed in the Schuylkill River station of the company, to change the frequency of the generated current to that necessary for traction purposes. It will be 55 ft. long, and will rise to a height of 22 ft. above the foundations; the motor section of the unit will develop 60,000 horse-power at 100 per cent. power factor, or 41,250 horse-power at 70 per cent. power factor.

The Lighting of Coal Mines.

Some Interesting Miners' Electric Safety Lamp Tests.

AT a recent meeting of the Illuminating Engineering Society in London, at which Mr. C. C. Paterson presided, a discussion on the subject of "The Lighting of Coal Mines" was opened by Mr. Eric Farmer, investigator to the Industrial Fatigue Research Board, who described a series of recent tests which indicate the importance to be assigned to the exposure of the bright filaments of miners' electric lamps. He explained that methods of diffusing the light, *e.g.*, painting the inside of the protecting glass cylinder with hydrofluoric acid, had an evident good effect in diminishing the intensity of "after images" and reducing glare. Although this occasioned some loss of light, it was found that 53 per cent. of subjects had better visual acuity with the translucent light than the transparent; 32 per cent. had equal vision in both cases, and only 14 per cent. had lower visual acuity with the translucent glass. The tests thus supported the view that the diffusion of the light was an advantage, and it was found that in the case of men suffering from "nystagmus" the effect was particularly beneficial. Nevertheless, methods of diffusion would yield still better results if a higher illumination could be provided, and in this connection Mr. Farmer mentioned the possibility of larger batteries being employed, which would enable lamps of higher candle-power to be used.

The hon. asst. secretary read letters from the Rt. Hon. William Brace, M.P., and Mr. Henry Walker (of the Mines Dept.), Mr. E. Fudge (secretary of the Miners' Lamp Committee) and Mr. Frank Hodges (Miners' International Federation), expressing their interest in the meeting and their recognition of the importance of good lighting. Communications from Dr. T. L. Llewellyn, Dr. H. S. Elsworthy, and Prof. W. Thornton were also read. Dr. Llewellyn referred to recent advances, such as the greater use of electric lamps, improvements in both oil and electric lamps, and the whitewashing and stonedusting of underground passages. He believed strongly in the cap-lamp, but this pattern had not been a success except in some districts of Scotland, although it was almost universally used in America. Dr. Llewellyn also endorsed the importance of avoiding glare, but preferred to overcome it either by careful placing of the lamp, by the use of the cap lamp, or by reflectors. Translucent glass had not been well received by miners, but yellow glasses seemed to meet with approval. During the journey to the coal face the use of a shade at the back of the lamp should be compulsory; it was very trying to the eyes to follow a line of unshaded lamps, and difficulty in this respect was an early symptom of eye-trouble.

In conclusion, Dr. Llewellyn presented data for nystagmus and cases of disablement, which showed a disappointing increase during 1923 and 1924. This was doubtless attributable largely to abnormal conditions, and he still believed as strongly as ever in the importance of better light.

Dr. H. E. Elworthy's communication was confined to the use of yellow-tinted glasses. Data presented for a colliery in which they had been adopted showed a marked decrease in the number of cases of nystagmus.

Prof. W. Thornton's communication suggested that, if miners felt the same confidence in the electric lamp as a detector of gases as they felt in the oil lamp, this would overcome a great deal of the reluctance in adopting the former. Nystagmus, in some cases, was partly a mental effect, an "apprehension neurose." Prof. Thornton also indicated the possibility of conveying electricity to working places by suitable cables, using low-voltage a.c. at higher frequencies than those at present used. The idea would need careful testing, but similar methods were already used for signalling purposes.

An interesting discussion followed, in which Mr. J. B. Lawford (past president of the Council of British Ophthalmologists), Dr. D. G. Coles, Dr. Miles, Mr. W. Plummer (Ceag Miners' Supply Co., Ltd.), Mr. S. J. Wrigglesworth (Oldham & Sons, Ltd.), Dr. R. Lessing, Mr. E. A. Hailwood (Ackroyd & Best, Ltd.), Mr. Cooke, Mr. T. J. Sack (G.E.C.), Mr. L. Gaster, and Mr. C. C. Paterson (chairman) took part.

A point strongly emphasised in the discussion was the desirability of supplying bulbs for miners lamps of good quality, operated at a reasonably high efficiency. Mr. T. J. SACK pointed out that small 2-volt lamps for miners' lamps could not be expected to have a life comparable with that of the ordinary household lamp, and that to insist on a life of 1,000 hours meant an efficiency not high enough to give even the legal minimum of 1 c.p. The great gain in light secured by adopting a higher efficiency was strikingly illustrated by a demonstration, and the candle-power attainable from gasfilled lamps, operated at a somewhat higher voltage, was also shown. Mr. Plummer exhibited a "Ceag" lamp working on a 4-V accumulator, giving four times the light from a standard lamp with less than twice the weight.

Other points referred to included the cap lamp, and the possible explanation of the preference shown by miners for the yellow-tinted glass cylinder. Mr. Hailwood dwelt at some length on available statistics relating to nystagmus, and exhibited some lamps of the flame type.

After a vote of thanks to the author and exhibitors, it was announced that the next meeting would be devoted to an exposition of the work of some of the B.E.S.A. committees concerned with various aspects of illumination.

Russian Electrical Notes.

Scarcity of Raw Materials.—The State Electrical Trust (the amalgamation of the Central and the Leningrad trusts) reports great difficulties in obtaining the necessary quantities of various raw materials for the different manufacturing works. This is the case with dynamo and transformer iron and certain qualities of steel, and the question of importing the balance required has been put before the General Electrical Commission as the controlling authority of this trust. The dearth of zinc, lead and tin is said to be even "colossal."

The Schatur Peat Fuel Station.—The Schatur station, which employs peat fuel, and is expected to form the main basis of supply for Moscow, was originally projected for a capacity of 48,000 kW. Owing, however, to the growth in the demand for energy in Moscow it is now proposed to add to the station a 35,000-kW turbo-generator and to build an annexe to house a set of not less than 25,000-kW capacity. It will also be necessary to install six further boilers, and foreign firms have offered to deliver these in May if the orders are placed in January.

Automatic Telephone Exchanges.—The production of automatic telephone exchanges with a capacity for 10,000 subscribers is reported to have been commenced at the Kulakoff works. Hitherto such exchanges have only been constructed in Russia to accommodate 1,000 subscribers.

Interconnection of Stations.—The Nischni-Novgorod station has now been connected up with the Balachn generating station and will regularly receive a supply of energy from the latter. It is intended that the Balachn station shall also furnish electricity to a number of industrial undertakings in the r gion of Nischni-Novgorod.

Production and Demand.—Despite the development of the producing industry it is impossible fully to satisfy the requirements of the market. The production of machines and apparatus in 1924-25 represented a value of 15,500,000 pre-war roubles, which only met the demand to the extent of 75 per cent. In the current year the value of the output of the General Electrical Trust in machines and apparatus is estimated to be 24.5 millions of roubles, but even if this is realised the market will only be supplied with 90 per cent. of its needs, according to the estimates of the General Electrical Commission. It is at present difficult to judge whether this programme of production will be carried out, as the whole were already practically loaded to their full capacity in 1924-25 and any further expansion will depend upon the provision of new equipment. The estimates of the Commission anticiplate that the home demand for machines and apparatus will increase to 39 million roubles in 1926-27, 53.8 millions in 1927-28 and to 67 millions in 1928-29. The manufacture of cables is situated in the relatively best position as beside the cable factories of the general trust there are factories belonging to the Tsbetmeta and the cable factory in Kieff, which will not be fully occupied in the current year. On the other hand the factories of the General Electrical Trust, which turned out cables to the value of 22.5 million roubles in 1924-25, will manufacture to the extent of 33 million roubles in the current year. In the case of lamps it is mentioned that the demand is growing simultaneously with the production, while the imports are constantly diminishing and now only form about 15 per cent. of the total number placed on the market, most of the imports being gasfilled lamps. The development of the home manufacture of lamps is illustrated by the fact that the total output of all the factories amounted to 6,500,000 in 1923-24. 10,500,000 in 1924-25, and the number is expected to be increased to 16,500,000 in the current year. Besides the national production of installation materials at various works, a considerable quantity is imported from other countries. Owing however to the variation in nomenclature consumers are said not always to be able to find what they require, and the General Electric Commission therefore proposes to work out a system of standardisation. Fittings and heating appliances are not entirely covered by home production so that in these cases also a quantity has to be obtained from abroad. The value of the output capacity of the works producing fittings is stated to be 3.5 million roubles and the production of heating appliances is said to amount to 2 millions of roubles. Notwithstanding extensions the home output of carbons is also unable to satisfy the demand, while only 50 per cent. of the market requirements is met by the home production of ammeters, voltmeters, &c.

Steam Turbine Construction.—A conference on the question of the economical construction of steam turbines in Russian works was held in Leningrad at the beginning of January, between the General Metal Commission and the Leningrad Machine Trust. It was stated that the cost of constructing a 5,000-kW turbine was not only greater than the cost of a foreign machine (270,000 roubles as against 200,000 roubles) but also that the steam consumption was higher in the case of the Russian turbine. The conference reached the conclusion that the causes of the higher price were the dearness of materials and the limited number of orders, and it was decided to put before the competent economic bodies the question of the policy to be observed in future in the matter of the construction of machines at Soviet works.

Moscow Supply Developments.—The minimum demand for energy on the stations which supply Moscow is expected to amount to 160,000 kW in the autumn of this year, but as delay may take place in the installation of the third generator at the Schatur station, there will only be a reserve of about 4,000 kW available. Should this contingency arise it will be necessary to make a change in the hours of supply to consumers and temporarily cease connecting up new customers. In 1927 the capacity of the Moscow stations will be increased to 287,000 kW by the erection of a machine of 35,000 kW at the Schatur station, a machine of a similar size at the new Kaschir station, the addition of one of 16,000 kW at the old Kaschir station, and the erection of two units each of 16,000 kW at the first Moscow station. In general the expenditure will be defrayed out of the profits of the Moscow supply undertaking (Moges) for two years and by the utilisation of the redemption fund

Tramway Motors.—The two trusts which are now embodied in the General Electrical Trust have for the past two years been occupied, among other matters, in assisting in the restoration and extension of the tramways in various towns and in the construction of new types of motors and controllers. New motors of 100 h.p. were built at the beginning of 1924, together with motors of 50 h.p. and these are claimed to be equally as good as foreign types. The value of the orders for tramway equipment placed with the trusts rose from 800,000 roubles in 1922-23 to 2,500,000 roubles in 1923-24 and to 5,000,000 roubles in 1924-25, and the output will be considerably increased during the current year. The trust is contemplating the introduction of electric traction on the railways, and a beginning in this direction is to be made by the Commission for Ways and Communications in connection with the Moscow surburban lines in the near future.

Colliery Electrification.—An expenditure of 14,196,000 roubles is being incurred this year on the electrification of the coal mines in the Southern basin of the Donetz, and of this total about 7,000,000 roubles has been or is to be spent on the acquisition of electrical equipment from abroad. Excluding a few exceptional cases, all the mines will receive a supply of energy from the Shteroff generating station, which will be put into operation next June, when 17 mines will be electrically equipped, out of a total of 21 mines for which plant of 6,680 kW has already been ordered.

Transformer Failures.—At the Krasnaya Svesda generating station (62,000 kW) at Baku a breakdown is reported to have taken place in one of the two 12,500 kW transformers made by the Kharkoff works of the former Central Electrical Trust. This is the second recent failure, a 2,000/20,000 V, 2,000 kW transformer having previously burned out and caused a fire in a sub-station.

English Engineers in Russia.—It is reported that English engineers representing Vickers Ltd., arrived in Leningrad in the third week in December for the purpose of undertaking the erection of equipment for the principle sub-station of the Volkhoff hydro-electric works. The installation of high-pressure transformers, each weighing 45 tons, necessitated the construction of special platform trucks at the Putiloff works.

New Stations. — The Electric Planning Commission has expressed the desirability of commencing the construction of a regional station in Artemovsk of a capacity of from 16,000 to 20,000 kW, with a transmission line from this place to Rostoff. The expenditure is to be defrayed out of the funds included in the budget for this year, and by local capital.

The Commission has also had under consideration a scheme for the establishment of a hydro-electric works for the utilisation of the Falls of the Purt at Gizel-Don for the supply of energy to Vladkavkaza, and a number of towns in the Beslansk district, as well as for metallurgical purposes. The capacity of the station is put at from 6,000 to 9,000 kW.

Submarine Cable Restoration.—The Commission of Posts and Telegraphs is about to begin the restoration of the submarine cable between Baku and Krasnobodsk in the Caspian sea. This cable was damaged in many places and has been out of service since 1920. A period of three months will be required to complete the work.

Defective Products.—A committee has been dispatched to the mills of the Gusevsk combination to investigate complaints made by the managers concerning alleged defective equipment supplied by the General Electrical Trust. In general the complaints concern the small motors provided for the weaving looms, no fewer than 12 motors out of 44 having burnt out between October 23rd and November 11th. At the same time two large 6,000 V motors which were imported broke down on the day they were put into operation. As to the failure of the small motors of from 3 to 5.5 h.p. the Trust states that their construction was hurried in order to ensure delivery by the stipulated time; the large motors were tested at the works and taken over by a committee which included representatives of the Gusevsk. In addition it is stated that defects have been discovered in the measuring instruments supplied by the Low Pressure Trust. The electrotechnical section of the conference now sitting on the quality of Soviet manufactures has presented a report dealing with the complaints made concerning the glow lamps turned out by the lamp factories. Despite the improvements already carried out, the conclusion is reached that insufficient care is taken at the lamp factories. The section states that the telephones are inferior to those produced before the war, the reason assigned being the inadequacy of raw materials of the desired quality. It is now suggested that the Electrotechnical Institute should be em-

powered to obtain the services of foreign specialists to assist it in the investigation of the problem.

Defects are reported to have been discovered in boilers at the Sverdloff generating station built by the Leningrad Machine Trust. A commission has been sent to investigate the matter; the defects are said to be due to the absence of representatives of the Trust on the occasion of the erection of the boilers.

Automatic Telephones.—Having in view the realisation as quickly as possible of a scheme for the introduction of automatic exchanges, the Low Pressure Trust has purchased a large quantity of necessary appliances and materials in Sweden. The payment for the orders has been guaranteed by the Bank of Industry.

Rural Electrification.—Adopting a report of the National Commission of Finance and the State Planning Commission, the Council of the National Commissioners has decided to allot 15,350,000 roubles to works of electrification this year in rural localities. Of this total 5,000,000 roubles will be derived from the loan for economic restoration and the balance will be assigned from the State budget.

Electrical Wholesalers' Federation.

Annual Dinner.

THE annual dinner of the Electrical Wholesalers' Federation was held at the Trocadero, W., on February 4th, with Mr. A. HOLMAN (president) in the chair. After a well-served dinner and the loyal toast, Mr. A. G. BEAVER (past-president) proposed the toast of "The Distribution of Electric Supply and Supplies." The speaker referred to the Government's electricity proposals and said that although details were not yet available it had been indicated that development would be left in the hands of private enterprise. It was said, however, that municipal authorities had been advised to apply for full trading powers. If this was a part of the Government's Bill it would be strenuously opposed by the industry. There were municipalities which realised that their best interests were served by working with and through the contractor, but a change of committee might alter this attitude and if full trading powers were possessed they would be utilised. The history of the gas industry would be repeated, where the companies supplied the appliances and did the work and took their profit through the gas consumed. Manufacturers should consider the possibilities. He considered that agreements limiting the scope of municipal trading activities should be arrived at between the interests affected. He pleaded for unification and co-ordination of all branches of the industry; the E.D.A. was the proper body to undertake this task. In conclusion, he said that, so far, the contractors had fought municipal trading alone, but it was now the intention of the E.W.F. to give them adequate support.

Mr. T. ROLES (past-president, I.M.E.A.), replying to the toast, said that his department at Bradford had full trading powers and was exercising them to a certain extent. Electricity was already cheap in the large provincial towns and the Government would find it difficult to secure lower prices. It had to be borne in mind that electricity could be taken to the people, but they could not be forced to use it. Cheap coal had retarded the use of electricity for power; moreover, steam had often to be raised for process work, and the question of driving became a minor item. There were other adverse factors, but in spite of industrial depression, the load had continued to grow, which pointed to an expansion in the domestic use of electricity. With regard to rural development he thought the city consumers would refuse to be bled to support non-paying schemes. The only way to reduce the price of electricity was to increase the output. That could best be effected by unification and consolidation and persistent propaganda. With regard to municipal trading the Government's Bill would no doubt upset a number of interests, but the good of the nation as a whole must be the first consideration.

Mr. D. N. DUNLOP (director B.E.A.M.A.) also replied to the toast. He said that he did not think that it was the Government's intention to interfere with efficient stations. He did not view the matter as a purely electrical problem. He thought that the Government's scheme was an effort to make the best use of our coal resources, and no doubt the gas industry would have to be considered in conjunction with it. The proposal to place the Executive Board under the Electricity Commissioners was an unusual arrangement and not altogether satisfactory. The Board should consist of men of very great experience and should have complete control. The standardisation of voltage and frequency would need very careful treatment and existing conditions in some important areas should not be disturbed until a proper state of development was reached. He did not agree with the suggestion that the E.D.A. should be asked to call the sections of the industry together with a view to co-ordination, it already had enough to do. The sections concerned should get together themselves and thrash out the whole matter. Referring to municipal trading, he said that he hoped that every enlightened municipality would see the need for the wholesaler and contractor.

Mr. H. H. BERRY, in proposing the toast of "Our Guests," referred to the recent death of Mr. Tate, the secretary of the Electrical Contractors' Association, and the company stood in silence as a tribute to his memory. Mr. Berry then made reference to the presence of Mr. T. Alger (president of the E.C.A.), Mr. W. Preston, M.P., Mr. J. W. Beauchamp (director E.D.A.), Messrs. Sully and Fletcher (E.L.M.A.), Mr. Atkinson (director C.M.A.), and Mr. Cramb (I.M.E.A.).

Mr. T. ALGER, in responding to the toast, said that the wholesaler and contractor were placed in a serious situation in connection with municipal trading. The contractor's business was immediately affected, but the wholesalers would eventually feel the strain. This trading was the thin edge of the socialist wedge, and he was very glad that the E.W.F. had decided to support the E.C.A. in its fight against these powers. The House of Lords Committee which gave full trading powers to Bath, Barrow and Burnley last July, did not know what a serious thing it was doing. The contractor had trained fitters, had canvassed and done a great deal of pioneer and educational work, and he should be given a "place in the sun." Elaborate and expensive showrooms and installations which cost more than a consumer was charged, must either be paid for by high electricity charges or by the ratepayers as a whole.

Mr. W. PRESTON said that the electrical manufacturer had every reason to promote the welfare of electrical traders. Energies should not be distributed among sections. There might be too many intermediaries in the coal trade, but this was not the case in the electrical industry; the wholesaler was indispensable. In conclusion, he appealed for the support of British manufactures in spite of the flood of cheap foreign material.

Mr. J. WILSON proposed the health of the president, and Mr. HOLMAN briefly responded.

During the evening a musical programme was provided by the Misses Cathcart Lynn, Jeane Paule, and Leonie Lascelles.

Notes from Canada.

(From Our Canadian Correspondent.)

SOME weeks ago a scheme to utilise the great rise and fall of the tides in the Bay of Fundy for power purposes was voted upon in the State of Maine, U.S.A., and received the approval of the electorate. Mr. Cooper, a well-known United States engineer, proposes to spend about 75 million dollars for the purpose of developing from 500,000 to 700,000 h.p. in order to furnish electrical energy for the needs of Eastern Canada and the eastern United States. The scheme would involve building a series of dams from the mainland of Maine to that of New Brunswick, Canada; by this means, according to the *Canadian Engineer*, two basins, 100 and 50 square miles in area, in the Passamaquoddy and Cobscook Bays, respectively, would be formed. The dam gates to the larger basin would be kept open during rising tides and those to the smaller during falling tides. The scheme is of interest to Canada because one end of the dams would be on Canadian soil and also because part of the electricity generated would be available for use in this country. Mr. Cooper believes that the project can be financed if proper agreements between the Governments of the two countries can be arrived at.

Another proposal of a unique character has recently been given publicity by Mr. C. Lorne Campbell, a Toronto engineer. Mr. Campbell believes that two of the rivers (Albany and Ogoki) now flowing into James and Hudson Bays, could be dammed and made to run southward—by cutting a canal through the height of land—to the Nipigon River, whence their waters would reach Lake Superior, thus finally arriving at the Atlantic Ocean by way of the Great Lakes and the Niagara and St. Lawrence Rivers. This bold plan would create a sixth great lake about twice as big as Lake Ontario, measuring some 200 miles by 90 miles and submerging about 18,000 square miles of land.

The extra water flowing in the new direction would, it is claimed, furnish about 200,000 more horse-power at Cameron Falls, near Port Arthur, where the Hydro-Electric Power Commission of Ontario has its Nipigon development; about 50,000 h.p. more at Sault Ste. Marie, and about 300,000 h.p. more on the Niagara River. The cost of the proposed scheme is estimated at about $200,000,000. No mention seems to have been made of extra power being made available on the St. Lawrence River, but there would certainly be some. The levels of the Great Lakes would also be raised a little, which would benefit navigation. The land to be submerged contains much timber suitable for pulpwood and other purposes which, according to the author of the scheme, could be cut and sold. Such a plan would take a long time to get started on account of the many factors, legal, financial, and engineering, which would have to be considered.

The Iron and Steel Institute.—The annual meeting of the above Institute will take place on May 6th and 7th, at the Institution of Civil Engineers, Great George Street, London, S.W.1, by kind permission of the Council, and the annual dinner will be held on May 6th, at the Connaught Rooms, Gt. Queen Street, W.C.2. It is expected that, by the kindness of the Swedish Ironmasters, the autumn meeting, 1926, will take place at Stockholm. As soon as the arrangements have been confirmed, the date and further details will be announced.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

New G.E.C. Motor Starters.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, recently introduced a comprehensive range of multiple-lever contactor motor starters for use with d.c. motors of from 80 to 300 h.p., not exceeding 500 volts, and full-load currents of from 150 to 550 amperes, as starters of the face-plate pattern are not suitable for such large currents. They consist of a single-pole contactor with an overload relay for connection to the line, and a number of single-pole switches, each of which cuts out a section of the starting resistance, the number of sections depending on the capacity of the starter. Operated by a hand wheel and worm, the latter sliding along a keyed shaft, the contactor and switches are mounted on a slate panel, and the cast alloy grid resistances are mounted below the switchgear, the complete apparatus being enclosed in a steel-plate casing. When the "start" push-button is pressed, the solenoid of the line contactor is energised, and with the push button still pressed the hand wheel is turned so as to rotate the sliding worm, which engages with the heel of each of the switches and closes them one at a time. When the last switch is closed, the motor is connected to the line and the push button can be released. The "stop" button causes the line contactor to open, and it is impossible to switch on the current with any of the starting resistance short circuited, or run the motor with a portion of the resistance in circuit. The contactor automatically interrupts the motor circuit should the supply fail, and full protection is provided against overloads. Cable inlets are provided at the back of the starter.

A Screw for Hammer Drive.

The latest development of the RAWLPLUG CO. OF CANADA, Southam Buildings, Bleury Street, Montreal, is the "Drivscru," illustrated in fig. 1. By virtue of a very coarse and wide-angle thread, the screw may be knocked in instead

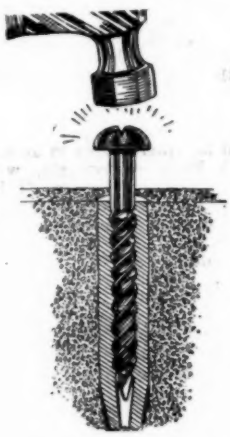


Fig. 1.—The "Drivscru."

Fig. 2.—"Quickfix" Gallery.

of turned with a screw driver in the usual manner. This device should prove an attraction to those wiremen and others, who show a preference for the hammer to the screw driver.

A New Shade Gallery.

A new gallery for electric light shades, the "Quickfix," fig. 2, which has been designed for quick operation, has recently been put on the market by MESSRS. CHARLESWORTH PEEBLES & CO., 5, Eden Street, Hampstead Road, London, N.W.1. The feature of the device is a circular steel spring, fitted with three lugs suitably shaped to fit inside the top of the globe or shade to be supported, which is fixed, at its centre, internally to a metal band composing the base of the gallery. By pressing together the ends of the spring, which are suitably finished outside the band, the diameter of the spring is reduced. The globe or shade is then put in position and the spring released, when the lugs will, it is claimed, firmly grip the shade. It is claimed that this is the only gallery on the market which grips the shade from the inside. The spring arrangement allows for the expansion and contraction of the glass, &c. The absence of tightening screws is another feature which is claimed to give this gallery superiority over the usual types.

An Automatic Current Calculator.

The LANCASHIRE DYNAMO & MOTOR CO., LTD., have sent us a sample of a limited supply of automatic current calculators which is available to those interested. The principle of the device lies in the usual desk calculator, and the attraction between two bar magnets, one fixed and one free.

Electric Rivet Heaters.

The accompanying illustration, fig. 3, shows one of two electric rivet heaters which are being produced by the AMERICAN HOIST & DERRICK CO., St. Paul, Minn., which are intended for rivet-heating work in boiler and tank shops, &c. The model illustrated is designed particularly for use on structural work and four rivets are heated simultaneously. Three contact elements are provided. The centre set is stationary and is used at both top and bottom positions. Upper and lower sets are arranged to slide up and down and are actuated by foot

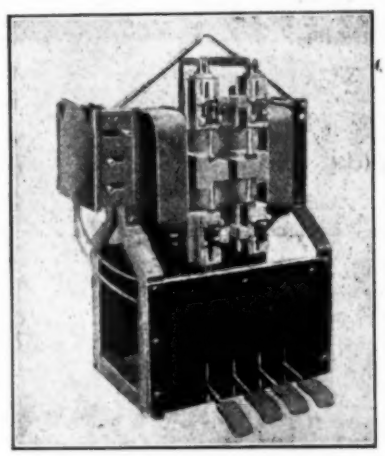


Fig. 3.—Electric Rivet-Heater.

pedals at the front. The stroke and setting of the sliding contacts permit of heating rivets up to and including 9 in. in length. The control switches are interlocked and arranged to regulate the current for varying the heating speeds and rivet sizes.

An Electric Ploughing Tractor.

We illustrate herewith, in fig. 4, an electric ploughing tractor which is marketed by ETABLISSEMENTS JOYA, Grenoble, France, and for which Mr. Paul Dieny, 20-21, Laurence Pountney Lane, London, E.C.4, is the agent in this country. The "Mototreuil" has been designed particularly for market gardeners and for vineyards. The motor and driving equipment are mounted on a two-wheel truck. A driving pulley which is belt driven from the motor is geared to a drum from which

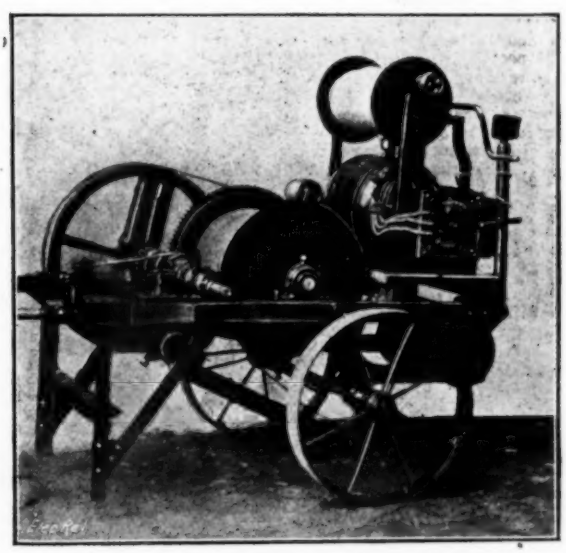


Fig. 4.—The "Mototreuil" Electric Plough Tractor.

the wheels are propelled by a chain drive. The necessary supply cable is carried on a small drum placed over the motor and is wound by means of a small hand winch. It is claimed that when ploughing with a Brabant single, 11-in. plough, making a furrow 14 in. wide, such a machine would cover one acre in seven hours. With a double plough, making two furrows, 7 in. deep on a width of 2 ft., the same area can be ploughed in four hours. Larger machines equipped with motors up to 15 h.p. can be supplied.

The Physical Society's Exhibition.

Annual Display of Electrical Instruments and Scientific Apparatus.

(Concluded from page 232.)

H. Tinsley & Co.

Among the large number of exhibits on this stand, including several forms of potentiometers and the strobometer, an improved form of Dr. Drysdale's stroboscope, the most interesting instrument seen was a Willans test set. This has been devised for testing the performance of intervalve transformers by measuring their voltage amplification in conjunction with an appropriate valve. It depends for its operation on a novel bridge arrangement whereby both the phase shift and scalar amplification are given. The anodes of two valves, the filaments of which are controlled by separate rheostats, are connected in parallel through a pair of telephones to a h.p. supply, and to the grids of the valves are applied alternating pressures from any source. If the valves have linear characteristics and identical mutual conductances, and if the grid pressures are equal and in phase opposition, then no sound will be heard in the telephones. Fig. 26 is a simplified circuit diagram of the apparatus. Valve A is followed by an intervalve transformer T, and the object of the measurement is to ascertain the vector voltage amplification of these. The anodes of valves B and B' and the primary winding of a telephone transformer P are connected in parallel. To the grid of the first valve is applied a fraction of the input pressure to a bridge of four arms, three of 1,000 ohms resistance and one in general slightly different from that value. The condenser C can be connected either across the arms 2-4 or 3-4.

The mutual conductances of the valves B and B' are rendered the same by means of connecting the grid of valve B to the point 3 on the bridge, and obtaining a balance, and by adjusting the filament resistances of these valves the sound in the receivers is made zero. By changing over the switch S_1 to the output of the pressure amplifier, and displacing the balance of the bridge until the output pressure is such that no sound is heard in the telephones, the output pressure of the transformer is made equal and opposite to the pressure across the bridge arm 2-4, and the input pressure to the amplifier equal to the pressure between points 1 and 4 on the bridge. Consequently the amplification ratio is equal and opposite to the ratio of these pressures, which may be readily calculated. An essential feature of the instrument is that there is practically no impedance either in the input grid circuit or in the output anode circuit. For the purpose of measuring voltage amplification of very small value, means are provided (not shown in illustration) for connecting the grid of B' to a tapping point in the resistance of the arm 2-4. Numerous measurements are claimed to have been carried out with this apparatus on intervalve transformers of all kinds, and results almost exactly in agreement with theory have been obtained. The analysis of a transformer is far more readily carried out by virtue of the fact that the vector ratio of amplification is yielded by the measurement, and it is possible to predict the amplification of the transformer at frequencies beyond the range of convenient measurement by extrapolation.

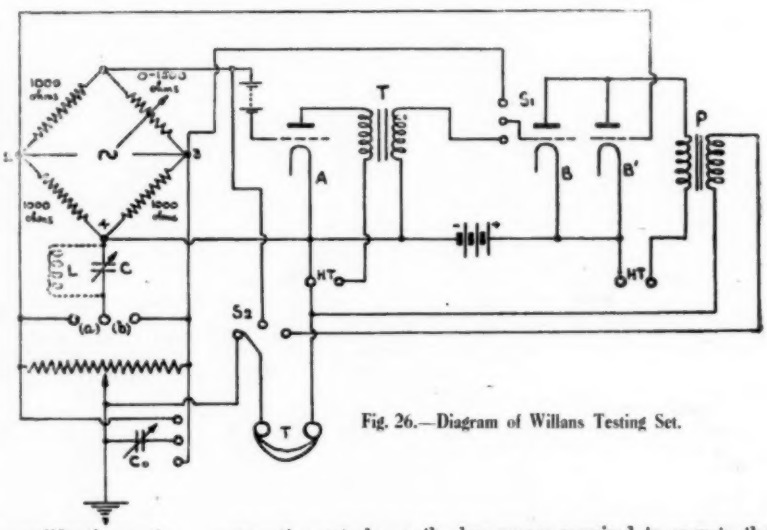


Fig. 26.—Diagram of Willans Testing Set.

Kelvin, Bottomley & Baird, Ltd.

This company had a very interesting exhibit of quartz mercury-vapour lamps, "daylight" lamps, and ultra-violet light apparatus. The mercury-vapour lamps are of the K.B.B. atmospheric type, the radiation from which is very rich in ultra-violet rays. The lamp is started without the use of tilting mechanism by means of a small heating coil surrounding a limb which projects from the arc tube; when the lamp is switched on, the arc is started by the vaporisation of mercury in this small bulb, and directly the arc is established the heating coil is automatically cut out of circuit. The lamp being atmospheric, can easily be opened for cleaning, consequently the quartz burner, apart from mechanical breakage, is practically everlasting. This type of lamp was shown with a variety of portable floor stands and other fittings with which it can be conveniently employed for therapeutic purposes, whilst the operator is protected from the ultra-violet rays by suitable means. Spun aluminium localising tubes of various shapes are provided with the lamps, and the apparatus is so designed that the light can be thrown in any required direction. The lamps are made for any d.c. pressure from 100 to 500 volts, and take a starting current of 4½ amps., the steady current being slightly under 3 amps. when the lamp is burning. The whole of these apparatus are of British make.

The K.B.B.-Macbeth artificial daylight lamps consist of ordinary clear glass incandescent lamps, the light from which is corrected by passing through a special filter which is of solid tinted glass. The filters are graded so that any desired daylight equivalent ranging from sunlight to blue skylight can be obtained, and the lamps are housed in fittings of various patterns. According to a report of tests made by the National Physical Laboratory on one of these lamps, the light exactly matched the colour of an overcast northerly sky.

Gambrell Bros., Ltd.

This firm had a large display of apparatus for general testing, comprising resistance boxes and bridges, potentiometers, galvanometers, voltmeters and ammeters, and accessories, as well as wireless apparatus and components.

A. Gallenkamp & Co., Ltd.

Electric furnaces in operation were shown at this stand as well as electro-titration apparatus and an electrically-heated thermostat bath with automatic temperature control to within one hundredth of a degree Centigrade; a special feature of the automatic control was the low power required to operate the relay, which acts with 0.2 milliamp.

Research and Experimental Section.

This section was a novel and very welcome feature, enabling a number of processes and laboratory expedients to be demonstrated. In group A, the Accoustical Section, War Office (Major W. S. Tucker), showed a sound locator for determining the position of aircraft, a camera and automatic developer for recording galvanometer deflections, and special types of the Tucker hot-wire microphone. From the Admiralty Research Laboratory, Teddington, there came a chronometer with a phonic motor drive designed to measure a time interval of the order of a few seconds with an accuracy of one-thousandth of a second for submarine sound ranging and similar measurements. Other exhibits from the same source were piezo-electric oscillographs, a neon lamp time marker, and visual leader gear.

Prof. H. L. Callendar, F.R.S., and Dr. H. Moss showed their electric air flowmeter. The Research Laboratories of the General Electric Co., Ltd., showed a great variety of ingenious devices for use in a research laboratory; specially interesting features were joints between glass and silica, with the aid of pyrex, and large glass-to-metal joints for use on valves with water-cooled anodes. Henley's Research Laboratories showed Capt. P. Dunsheath's "solid diagrams," illustrating the characteristics of cable dielectrics, and the National Physical Laboratory showed an all-steel mercury-vapour vacuum pump, an X-ray tube for crystal analysis work, a mercury-cup thermo-electric key, and a hot-wire velocity meter, as well as various physical apparatus.

In group B a striking experiment was shown by Mr. G. L. Addenbrooke, in which a column of castor oil is attracted upwards to an electrode of an excited Wimshurst machine. Mr. W. Brooks Sayers showed some magnetic effects, and Mr. F. E. Smith, F.R.S., showed a simple current weigher "designed to show how easy it is to measure current in absolute units." Mr. F. H. Glew demonstrated magnetic levitation and radio-activity.

In group C Prof. Sir William Bragg, F.R.S., showed apparatus illustrating Faraday's discovery of electro-magnetic induction in 1831, and Mr. F. E. Smith exhibited the original rotating coil used in 1862 by the British Association Committee for the measurement of a resistance in terms of the centimetre and second.

A discourse was delivered on each evening, that on January 7th relating to "Electrical Listening," by Major W. S. Tucker, D.Sc. This lecture was illustrated by a series of exceedingly interesting demonstrations of the properties of microphones, especially the Tucker hot-wire microphones used in military sound ranging. It was shown how records were obtained of sound waves from various sources, including a siren and a thunderstorm.

There is no doubt that the new departures on this occasion, including the opening of the exhibition on the third day and the demonstrations of laboratory methods, greatly increased the success and popularity of this event, which has now reached its sixteenth year. Perhaps on the next occasion care will be taken that the general public is effectively informed of the privilege extended to it on the third day; we feel sure that if this were done a very large attendance would be recorded, and the educational value of the exhibition would be greatly increased.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The Government Electricity Scheme.—The Government's electricity proposals were frequently referred to in the House of Commons last week during the debate on the motion for the presentation of an address in reply to the King's Speech.

Mr. HURST, the mover of the motion, said that the House would welcome the proposed Electricity Bill, the object of which was to make the supply of electricity more abundant and more universally available in this country.

Mr. LLOYD GEORGE said that the more power we derived from electricity the more coal we saved. He welcomed the introduction of the new Bill, although the saving of coal would mean that more men would be unemployed in the coal-mining industry.

Mr. DENNIS HERBERT said that the new proposals had been received, by those competent to judge, with a considerable measure of caution, although there had been some cautious approval of them. He admitted that they could not allow private enterprise to have its own way entirely. There must be a certain amount of State regulation or co-ordination. Many members of the House sincerely hoped that the Government would be successful in the difficult task of so imposing a modified measure of Government control or Government organisation with regard to electricity, that it would prevent the danger of haphazard development by private enterprise, but would, on the other hand, avoid the blight of Government control.

Captain GUNSTON said that from a recent report he gathered that electricity could be bought in the Newcastle district considerably cheaper than in Ontario, and that should encourage us to develop our latent resources, which might do something to help the mining situation. It was very necessary, however, to educate the people of this country to the advantages of electricity.

Mr. SNOWDEN contended that an essential public service like electricity should not be permitted to be a field for the private exploitation of the public, and any scheme for the reorganisation of the electricity supply should consolidate and co-ordinate the whole of the business under public ownership.

In the House of Lords comment was also made on the scheme. Lord RAYLEIGH contended that in generating electricity, units of not less than 20,000 h.p. ought to be employed, and that necessarily involved the abandonment of all small-scale generating stations. This was one of the essentials of any real improvement in the electrical situation. The supplies of electricity must be linked up in different parts of the country by long-distance transmission lines and the whole country covered with an electrical network. The co-ordination of the electrical supply would require the standardisation of frequency all over the country, and this would be a difficult undertaking, involving, no doubt, the sacrifice of much valuable plant. Exactly how far the process could be carried was something which must be a matter of judicious compromise.

Lord HALDANE welcomed the proposed Bill, and said it was essential to have one standard of frequency. We ought to be the greatest manufacturers of electrical plant for export in the world. We had admirable electrical engineers and firms of electrical constructors, but they could not sell their products abroad as they should do because they had to manufacture for several frequencies here and another for the foreign market.

Notice has been given that the Bill will be introduced in the House of Commons, probably next week.

The Marine Wireless Dispute.—On February 4th, in reply to several questions on this dispute, Sir P. CUNLIFFE-LISTER, the President of the Board of Trade, said that he was aware that there were a number of ships that were without the services of wireless operators, and that on others there were operators who did not possess full qualifications. The question of appointing a Court of Inquiry was one for the Ministry of Labour. The action taken by the Government during the present strike was the same as that taken by previous Governments on similar occasions; it could be challenged in the Courts. The number of ships which had sailed without wireless operators since the beginning of the dispute up to the end of January was 1,187, 85 of which were passenger ships.

No ships subject to the provisions of the Merchant Shipping (Wireless Telegraphy) Act, 1919, had been reported missing since November 26th, 1925. A few such ships had been reported overdue, but they had all since arrived at their destinations.

The Severn Barrage Scheme.—On February 4th, in reply to Mr. Shaw, who asked if a report on the Severn barrage scheme had been presented by a scientific committee, Col. MOORE-BRABAZON, Parliamentary Secretary to the Ministry of Transport, said that the sub-committee of the Committee of Civil Research, who recently considered this matter, had reported to the effect that a *prima facie* case had been established for undertaking further investigations with a view to determining whether the technical difficulties of constructing a Severn barrage could be surmounted, and this recommendation had been accepted by the Government. It was not proposed to publish the report of this sub-committee, which was not a scientific committee, but when data had been accumulated he had no doubt that a report would be published.

Col. WOODCOCK asked Col. Moore-Brabazon whether he was aware that within a few miles of this proposed Severn barrage the city of Bristol was building enormous electric power stations at an initial cost of over £1,000,000. If the Government had given permission for these to be built, why should they go on with the Severn barrage scheme, which would supply the same area?

Col. MOORE-BRABAZON replied that the whole question of harnessing the tide in a country like this was very important. The possibility of the scheme from the point of view of power was in the neighbourhood of 300,000 kW.

The Factory Bill.—On February 4th, Sir W. JOYNSON-HICKS, the Home Secretary, informed Mr. Robinson that it was not proposed to proceed with the Factory Bill during the current session, but it was the intention of the Government that the Bill should be passed during the present Parliament.

Private Bills.—The following private Bills have been introduced into the House of Commons and read a first time:—The Bristol Corporation Bill, the Guildford Corporation Bill, the Hackney Borough Council Bill, the Mynyddislwyn Urban District Council Bill, and the Swindon Corporation Bill, some of the objects of which, among others, are to enable the various local authorities to make further provisions with regard to their electricity undertakings; the Lancaster Corporation Bill, the Hartlepools Corporation (Trolley Vehicles) Bill, and the Ramsbottom Urban District Council Bill, which will enable the local authorities to run trolley vehicles; the London Electric and Metropolitan District Railway Companies Bill, "to empower the London Electric and the Metropolitan District Railway Companies to execute works and the London Electric Railway Company to raise additional capital"; the London Power Company Bill, "to confer upon the London Power Company, Ltd., powers to acquire lands and to construct a generating station and other works"; the Metropolitan Electric Supply Company Bill, "to confer powers on the Metropolitan Electric Supply Company, Ltd."; and the Metropolitan Railway Bill, "to empower the Metropolitan Railway Co. to construct new railways and other works and to acquire lands."

Standards in Belgium.—The Comité Electrotechnique Belge, of Brussels, has adopted the recommendation of the International Electrotechnical Commission with regard to low-pressure standards. In future, therefore, the pressures to be regarded as standard in Belgium are as follows:—Direct: 110, 2 by 110, 4 by 110, 220, 2 by 220, and 440 V. Single phase: 100, 2 by 100, and 220 V. Three-phase: 110, 127 by 220 V (between phase and neutral point). The following table shows the high-pressure standards which have been adopted:—

1,000 volts	...	45,000 volts	
2,000 ,,	...	60,000	,,
3,000 ,,	...	80,000	,,
6,000 ,,	...	100,000	,,
10,000 ,,	...	150,000	,,
15,000 ,,	...	200,000	,,
20,000 ,,	...	300,000	,,
30,000 ,,			

A standard test for oils for transformers and switchgear has also been adopted.

Domestic Voltage Regulation.—Editorial remarks in the *Electrical World* make the fact apparent that domestic loads have grown so large in America that serious attention must be given both to voltage regulation and wiring in homes. The houses are becoming miniature machine shops with a variety of motors and heating devices which are bound to cause voltage fluctuations if the wiring does no more than comply with the formal underwriters' regulations. Some appliances, such as electric refrigerators, automatic pumps, ventilating motors, and oil-burner motors, have no respect for time, or load, and may start at the peak period, or at night when all lamps are burning. These voltage fluctuations are annoying because of their effect on the light, and they may become more so as relays and controls are developed and used for household applications. The supply authority may enlarge transformers and secondary distribution copper, and yet not improve the situation materially. "The answer to the problem lies in the development of some kind of house voltage regulator. All electrical men who study this situation will admit its serious character, for even now it is affecting the development of domestic load."

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

The Institution of Electrical Engineers.

It is understood that one of the rules governing admission to the Institution as an Associate Member is that the candidate must have held a superior position in one or other of the branches of electrical engineering for a period of not less than five years. A foreman, for instance, would not be eligible as an Associate Member no matter what degree of knowledge or skill he possessed. On the other hand, an individual with comparatively no electrical knowledge, but having sufficient cash to carry on an electrical business for a period of five years (with other people's brains), would be eligible. The foregoing is my interpretation of the rule referred to, but, of course, I may be in error. Previous to my obtaining particulars regarding the matter in question, I had always been under the impression that superior knowledge weighed more with the I.E.E. than superior position, but my impression has been in error. With all due respect of the Institution, I would suggest that they delete the word "position" and substitute for it "knowledge or skill." By this alteration an unfair and autocratic rule would be corrected.

Non-Member.

January 30th, 1926.

Electrical Showrooms.

The recent article by Mr. W. A. Gillott, A.M.I.E.E., and the letter of Miss Ethel Prentice will, I am sure, show a large number of readers the absolute necessity of electrical showrooms, if the general public is to get a sound idea as to the innumerable uses electricity can be put to for domestic purposes.

Being greatly interested in publicity matter for promoting the further use of electricity in the home, I quite agree that the value of a showroom has been sadly neglected. Every person who wishes to have electricity installed in his home is by no means an electrical engineer. It therefore remains to provide a scheme whereby this person can see with what simplicity domestic appliances can be operated. If given proper consideration, the best, and probably the only, scheme of any real value is a suitably-equipped showroom.

In the lay-out of a showroom, great thought, care, and time should be given to what exactly is required, and lighting schemes must be carefully planned. It is not a bit of use doing the thing haphazard—this will mean failure to attain the object aimed at. Each domestic appliance should be fitted in position with care, and every facility for the easy operation of any appliance should be provided.

The staff engaged in a showroom should be alert, and smart in appearance, and have a thorough knowledge and be able to give quick information on any points relating to the appliances shown, which a particular client may ask for. If possible, arrangements should be made so that practical demonstrations could be given with cooking appliances, &c., taking into consideration that the person chiefly interested in domestic appliances is the housewife; she is the person whose interest should be obtained, and to secure this interest a showroom would form a very good magnet, inasmuch as she would be able to see personally with what simplicity these appliances can be operated.

Further advertising matter would be an advantage. An illustrated booklet, leaflets, &c., dealing with the different domestic appliances, giving estimates of cost, and any further details which would be of service to the prospective purchaser, should be provided.

Mr. Gillott says in his article: "What of the contractor?" I will ask the question: "Is every contractor in a position to have a showroom?" Possibly not!—then, in my opinion, the supply authority in his district should have a well-equipped showroom; this could be a help to him instead of a hindrance. In any case, I hope that those who think not will take the offer made by Mr. Gillott in his article, and let us try to bring the full benefits that electricity can provide to the attention of the public.

A properly-organised and suitably-equipped showroom is undoubtedly one of the best forms of advertising. Now is the time, when electricity is coming so much to the fore, when the question of showrooms should receive the attention it rightly deserves.

R. Williams.

Birmingham, *February 1st*, 1926.

A National Electrical Convention.

In the ELECTRICAL REVIEW of January 29th, you invite expressions of opinion from those interested in Mr. S. T. Allen's proposals for the holding of a National Electrical Convention.

It seems to me that the outstanding value of such a function would be its educational value to the lay mind—both men and women—all of whom are potential users of electrical energy in one form or another.

We all realise that what is known as the electrical industry is too remote from the potential customer, who sees most of its difficulties in initiation and little of its tremendous mission as a distributor of comfort and of service, and as a great saver of time.

Further, the public needs to be educated on the question of, and reasons for, the cost of electricity, and to get rid of the idea that some malevolent engineer in the background is deliberately preventing its extension on lines which would bring its use to the door of everybody.

Part of the value of such a conference would be that a question of first-rate importance, such as the need for a better selling organisation, and more practical methods for presenting the electrical idea to the public, would be considered, and the best methods applied to this problem, as foreshadowed by the Prime Minister the other day.

Not one, but all, sections of the industry are vitally concerned in this aspect of our ever-growing needs.

In this connection may I again emphasise a suggestion which has found favour in a number of quarters—that the supply undertakings should train and employ a body of educated women who would eventually understand the general economic difficulties of the industry and be able to impart an understanding of electrical apparatus and methods in the home, in a way that every intelligent housewife can appreciate and understand. Such a liaison between the undertakings and the home consumer would do much to popularise the use of electricity.

Women demonstrators have done and are doing magnificent work, and a greater extension of their calling would do much to make electricity the national servant it is surely capable of being.

Such a conference as is projected, if it could discuss homely topics, as well as the wider questions involved in the industry, would, I am sure, be of the greatest benefit to all concerned.

With all the brains and organising ability possessed by the industry it seems to me that there is no difficulty whatever in the way of arranging a conference such as that outlined by Mr. S. T. Allen.

Caroline Haslett,
Director, Electrical Association for Women.

London, *February 1st*, 1926.

The Government Electricity Scheme.

It is already evident that opinions regarding the above scheme are by no means unanimous, and, further, are not likely to be.

It is evident that a great deal of adverse criticism is based on thoroughly sound reason, but, on the other hand, it is at least reasonable to assume that those responsible for drawing up the scheme found very good ground for arriving at their conclusion that it is financially and economically sound.

If we take these two views as extremes, perhaps the solution lies at a point between them.

We are told that the grid system is to materialise only gradually, and this in itself is sound, but financial soundness seems to me to hinge entirely on the method of growth adopted. It has been suggested that each J.E.A. should be left to develop its own already delimited district. I would suggest a combination of the two ideas.

Again, assuming that the Government has in view a more or less definite idea as to what the final realised plans are to look like, this plan should be published in full. Those parts of the scheme to be first dealt with, which are no doubt concerned with the more densely inhabited areas and where the minimum expenditure on interconnecting mains will bring the maximum benefits, could then be embarked upon. The J.E. Authorities of the remaining areas working with the ultimate plan in their minds could then each be left to develop its district, modelling its mains layout so that eventually with a minimum of further expense its system could be interconnected with adjoining systems.

It seems reasonable to imagine that much good preliminary work could thus be done by those independent authorities who would of course be guided by the Electricity Commissioners in the same way as at present, only with more authority as to the design of the feeder systems. It is the common experience in designing distribution systems that what might appear to be for the best at the moment is not by any means ideal if reasonable future developments are taken into account, and the same might apply to feeders if the "grand vision" is allowed to exert its influence. It is likely that in very many instances such a policy would alter the route of "backbone" feeders. It might conceivably also alter in some cases the class of feeder laid down, and incidentally influence the promiscuous tapping, the point of tapping, and the layout of sub-stations. Many more effects of such a policy will readily suggest themselves, especially to those dealing with larger districts, where the policy would be most applicable.

In any case, it is axiomatic that work done to a plan will mean greater efficiency than will haphazard procedure, and I see no reason why the electricity supply layout of this country should prove an exception.

Sevenoaks, *February 1st*, 1926. **C. F. Mounsdon.**

I was indeed interested in Mr. C. Culmer Hodges's letter in your current issue; so much so that I was constrained to turn up particulars of his station in "Garcke."

I feel that this is a most striking instance of a system which would be greatly benefited by the introduction of the Govern-

ment scheme. Here is an extremely small station (total plant capacity, 180 kW) which sells its electricity at 9d. per unit for lighting, 3d. for power, and 1½d. for cooking; the bulk of its load is lighting, its revenue being 7.39d., while its working costs were 5.46d., per unit sold, in the year 1924. Mr. Hodges states that a bulk supply would cost 3d. per unit: why not, then, sell at an average figure of 4.93d. per unit? This would enable electricity to be sold at the following prices:—6d. per unit for lighting, 2d. for power, 1d. for cooking, while still maintaining the same gross profit of 1.93d. per unit. Surely these are better than the present charges; and would they not most certainly encourage an increased use of electricity? If one assumes that all the electricity at present sold could be sold on the Dundee Tariff at the same total price (including the fixed charge of 8s. per 100 sq. ft.), then the fixed charge works out at 5.89d. per unit sold. If, then, a bulk supply was taken and the same fixed charge maintained, the electricity could be *given away*, and a magnificent profit would still be made!

It would seem that the small outlying town has much to gain by "Government" electricity.

H. J. Allcock.

Manchester, *February 1st*, 1926.

Let Your Boy Benefit by Your Experience!

The boy who, ambitious to become an engineer, has an engineer for his father, ought to be a happy boy. The father ought to be a proud father. Too often the father imagines himself a disillusioned man. The pet theme of many such fathers is that they know too much to wish their sons to follow in father's footsteps. So among engineers (as, indeed, in almost every other walk of life) there is a prejudice against James, junior, following the lead of James, senior.

So far as engineering is concerned—and many other trades or professions also—this is a grave mistake. The father knows, or he should know, the various ropes. Especially if he be a self-made man, he will be in excellent case to give his son a better start off than he was himself blessed with. Much of the blundering in a youth's career is due to his lack of direction. There are many who could *put him wise;* but, unfortunately, he does not know them, nor they him. But in the case postulated, Father knows—again, lucky son! The father can guide the son's career; often he can put a good word in for him with the people who can turn the wheels. Not infrequently a good workman, well in favour with foreman and manager, is able to get a son admirably placed—placed on an equality, as regards opportunity, with the best. Then it is up to the son to make good midst really favourable conditions for making good. Such a father, helping such a son, forgets his own disappointments if only his son wins his spurs. Such a son, being assisted by such a father, if he succeed, should be happy—not least of all because his father—no great success himself—helped him, the son, to rise. No matter how great his fame may be, the son's triumph will be his father's also.

W. Roland Needham.

Goodmayes.

The Metering of Three-phase Power.

I must thank "A Meter Superintendent" for his correction of my statement concerning the limits of accuracy of a two-element three-phase meter. The points which he mentioned were missed by me, as I had it firmly fixed in my mind that the subject under discussion was the metering of *three-phase* power and not the metering of other phenomenal circuits.

I feel sure that if your correspondent will keep that fact in his mind he will find that the conditions which I mentioned as being necessary for correct registration with a two-element three-phase four-wire meter are correctly stated.

It is, of course, quite easy to point out that an unequal voltage may be compensated by varying the angle between the phases; but such things do not usually happen in practice and, therefore, do not enter into this discussion.

If your correspondent will take my three conditions and read them one by one and treat each one separately, I think he will have no difficulty in finding them accurately stated.

H. Hugh Jaques.

London, *February 1st*, 1926.

Fraudulent Trading.

The radio industry to-day seems to be the happy hunting-ground for all business crooks and fraudulent traders. We, in common with many of our friends in the industry, have suffered extensively from these rogues, and we consider that it is high time the whole of the trade got together, and made a supreme effort to get the industry cleared of this parasite.

If all manufacturers in the industry got together—preferably through a trade association—it would be quite a simple and speedy matter to do this.

The methods of these fraudulent traders are, in all cases, almost identical—they start off as dealers in the radio industry, and are able by some means to furnish references, and offer to pay cash on delivery for goods. This arrangement is kept up for a short time, and then the manufacturer is informed that owing to large accounts outstanding, &c., they will be glad to have a monthly account, which is also paid promptly for a short time. Then a large order is sent—amounting to hundreds of pounds in some cases—and payment is not made. A writ is issued, but in the meantime a new company is formed and the manufacturer is told by his solicitor that the old company has no assets and execution cannot be made. The new company carries on business in the same premises and with exactly the same stock and carries on, presumably, a fresh course of robbery from other manufacturers.

We know of several conscientious, honest manufacturers, in a small way of business, who have been absolutely ruined through these transactions.

We consider that a means of stopping this sort of business would be for the radio manufacturers to form a small association, paying a subscription according to their turnover, and employ a first-class solicitor to take these matters up, however small the amount, and fight the case through to a finish, because if these fraudulent traders can get off scot free with a small amount, the next time the amount will be larger and so on, until very substantial sums are involved, whereas if they are stopped with the small sums, it is highly probable that the matter would end there, and they would be forced out of the trade.

We have a case now of our own in which approximately £300 is involved—a case of absolute fraud—and we intend, whatever it costs, to fight the matter through. Unfortunately it will undoubtedly be an expensive matter, as the law seems to be so loose with these rogues, and for a time they simply laugh at it; but they all make slips, and can generally be brought to book if the matter is pushed to the end.

We are quite sure that if the whole trade got together and pooled its information and notified all such cases, this fraudulent trading could be stopped, and it is high time that some action was taken in the matter.

There is another form of trading which we consider also comes within the category of fraud; a so-called wholesaler sends an inquiry to a manufacturer for a large quantity of goods. He is quoted the usual wholesale factors' discount, and he replies stating that he has to sell to factors, and in view of the quantity he is prepared to order, can he have a special discount? In some cases the quantity required warrants an extra discount, and this is given by the manufacturer. The wholesaler then takes about one-third of the quantity ordered and asks the manufacturer to hold up delivery, as sales have been slow and he has a fair stock, and the balance of the order is never taken. We also have one or two cases on our books of this description, and we intend to fight these cases also. We demand that either the balance of the order be taken, or that the wholesaler shall pay the difference between the ordinary wholesale factors' discount and the extra discount allowed him for the special large quantity ordered.

It would be interesting to hear the experiences of other manufacturers on this question.

For and on behalf of **S. A. Lamplugh, Ltd.**
J. STANLEY SPITTLE, *Managing Director.*

Birmingham, *February 5th*, 1926.

Laundering—As Others See It.

Commenting upon the Government's electricity scheme, "The Power Laundry" points out that "cheap electrical power will mean the wider adoption of the electric drive, and, so far as possible, individual drives for all the large [laundry] machines. . . . This should lead to a substantial cheapening in laundry costs. The use of the electric van for laundry work should also receive a great stimulus. Laundries will be cleaner, brighter and healthier. There is, however, another side to the matter, which is not quite so rosy. The universal distribution of cheap current to every household and the rapidly growing familiarity with its practical use may, and probably will, lead to the production of electrically-driven home washers on a considerable scale. With an electrically-driven washer, an electric iron, and an electrically-heated drying cupboard, the housewife will be tempted to do her work at home rather than send it to the laundry. As a matter of fact, this is what has actually taken place in the United States of America." This candid comment lends added interest to your editorials and articles on electric washers and home-laundry machinery (ELEC. REV., December 18th, *et seq.*), the potentialities of which, from the load-building viewpoint, do not appear to be generally appreciated.

N. L. W. E.

January 30th, 1926.

The All-Electric House.

I think your contributor, Mr. E. W. Dickinson, has a delightful sense of humour in describing himself as an "electrical enthusiast" at the end of his most useful piece of propaganda for the gas people.

But it was cruel of you not to tell him that the things he finds economically impossible are being done, almost at his doorstep as well as in many other parts of the kingdom; and that it was discovered long ago that his figures are only part of the story.

Those of us who have been using not only electric cooking but an all-electric house for years, know that we cannot get a similar service any cheaper with gas. Even if we could, we would rather go with a little less service than go back to such a wretched substitute, should severe financial stress make the saving of a penny or twopence a day a vital necessity.

If enthusiasm for electricity induces Mr. Dickinson to advocate the use of gas, I am longing to see him write on something that leaves him cold!

Ernest E. Sharp.

London, *February 6th*, 1926.

Trade-Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 3rd. In the case of foreign applications, the names and addresses of the British representatives are also given :—

Globar (lettering and design). No. 458,440. Class 4. Carbons and carbon compounds for electrical purposes.—American Resistor Co., Milwaukee, Wis., U.S.A. (Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

Encore. No. 456,530. Class 8. Instruments and apparatus for use in radio-telephony and telegraphy.—F. W. West and H. W. Jackson, 16, Lower Richmond Road, S.W.15.

Fairy. No. 460,823. Class 8. Thermionic valves.—Louis Kremner, 48a, Shudehill, Manchester.

Stiradio. No. 457,644. Class 8. High- and low-frequency transformers, loud speakers, crystal and valve receiving sets, detector crystals, headphones, variometers, variable and fixed electrical condensers, electric batteries and accumulators, thermionic valves, induction coils, &c., all for use in radio-telephony.—Stirlings, Ltd., 17, Clarence Street, Kingston-on-Thames.

Zenith. No. 461,778. Class 8. Electrical resistances potentiometers, rheostats, transformers, and rectifiers for accumulator charging and for other purposes.—R. Lehmann & Co., Ltd., Villiers Road, Willesden Green, N.W.2.

Microstat. No. 462,535. Class 8. Variable electrical resistances.—H. A. Yoward, trading as the Lifford Engineering Co., Lifford Lane, Kings Norton, Birmingham.

Radialities. No. 462,751. Class 8. Radio-telephonic and telegraphic receiving and transmitting apparatus.—Partridge's, Ltd., 118, Northwood Street, Birmingham.

Radiolys. No. 462,827. Class 8. Apparatus for use in radio-telegraphy and telephony, but not including receiving sets or loud speakers.—P. Danon, 80, Boulevard Haussmann, Paris. (Perowne & Co., 7, Great James Street, Bedford Row, W.C.1.)

Dikast Cleartron, CT. (lettering and design). No. 465,353. Class 8. Electric condensers.—Clearton Radio, Ltd., 1, Charing Cross, S.W.1.

Warmoto. No. 465,445. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—F. A. Hughes & Co., Ltd., 204-206, Great Portland Street, W.1.

Tonatron, No. 465,532, and **Sonatron,** No. 465,533. Class 8. Philosophical and scientific instruments.—E. A. Graham, trading as Alfred Graham and Co.

Ardar. No. 465,720. Class 8. Electron discharging tubes for radio and wired telegraphy and telephony, X-ray tubes, and rectifying tubes.—Mullard Radio Valve Co., Ltd.

Day-Fan (lettering and design). No. 464,829. Class 8. Radio transmitting and receiving apparatus and parts thereof.—Dayton Fan and Motor Co., Dayton, O., U.S.A. (White, Langner, Stevens & Parry, Jessel Chambers, 88-89, Chancery Lane, W.C.2.)

Igranic Pacent, No. 465,320, and **Igrametric,** No. 465,342. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—Igranic Electric Co., Ltd.

Neutron. No. 465,321. All goods in Class 8, except detector crystals for radio-telephony.—Neutron, Ltd.

Serenada (lettering and design). No. 462,578. Class 8. Loud speakers for use in radio-telephony.—Serenada Manufacturing Co., Ltd., 22, Paper Street, E.C.1.

Unipower. No. 463,993. Class 8. Electric accumulators and electrolytic rectifiers.—Radio Accessories, Ltd.

MH (lettering and design). No. 464,225. Class 8. Instruments and apparatus and parts thereof for use in radio-telephony and telegraphy.—L. McMichael, Ltd.

Neutroform. No. 464,753. Class 8. Component parts of radio-telephonic apparatus.—De Leeuw & Co., Ltd., Sentinel House, Southampton Row, W.C.1.

Lissenoleon. No. 465,734. All goods in Class 8.—Lissen, Ltd., Friars Lane, Richmond, S.W.

Arrolite (lettering and design). No. 464,677. Class 13. Electric incandescent lamps (ordinary).—Maybrook Electrical Co., Ltd., 15-16, White Cross Place, Wilson Street, E.C.2.

Typerlite. No. 465,437. Class 13. Electric lighting fittings.—Electricity Services, Ltd., 27, Martin Lane, Cannon Street, E.C.4.

Angelus Firefly. No. 461,629. Class 18. Electric heating and cooking apparatus.—Charles Joyner & Co., Ltd., Icknield Square, Birmingham.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

17,071. "Electric reciprocating motors." J. A. Traylor. July 16th, 1923. (219,321.)

19,278. "Telephone transmitters and receivers and the like." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). (Western Electric Co., Inc.). August 14th, 1924. (245,810.)

24,262. "Wireless transmitters." N. E. Davis and W. T. Ditcham. October 13th, 1924. (245,829.)

24,381. "Wireless telephone receiving systems." P. W. Willans. October 14th, 1924. (245,839.)

24,487. "Electric heating devices." British Thomson-Houston Co., Ltd., and F. W. Leevers. July 15th, 1925. (245,846.)

24,706. "Electrical discharge devices for use as translating apparatus." Westinghouse Brake & Saxby Signal Co., Ltd. October 19th, 1923. (223,589.)

24,717. "Means for eliminating disturbances at the ends of submarine telegraph cables." W. Estaugh. October 17th, 1924. (245,853.)

24,728. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd., and W. O. Passmore. October 17th, 1924. (Addition to 230,006.) (245,854.)

24,774. "Electric switches, and the manufacture thereof." J. A. Crabtree. October 18th, 1924. (245,855.)

25,362. "Crystal detectors for wireless receiving sets." H. T. Brooker and L. E. Williams. October 24th, 1924. (245,870.)

25,492. "Electrodes for obtaining therapeutic rays from an arc for medical and other purposes." W. G. Moore. October 27th, 1924. (245,872.)

25,553. "Variable resistances." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.). (H. R. van Deventer). October 27th, 1924. (245,874.)

25,889. "Starting equipment for electric current converters." T. W. Ross, R. Townend, and Metropolitan-Vickers Electrical Co., Ltd. October 30th, 1924. (245,876.)

25,892. "Poles for magnets or solenoids." A. West & Co., Ltd., and R. P. Bossom. October 30th, 1924. (245,877.)

25,898. "Holders for interchangeable electrical devices, such as thermionic valves, for use in wireless telegraphy and telephony." S. J. Levi. October 30th, 1924. (245,878.)

25,984. "Aerial wire." F. Ritter. July 29th, 1924. (237,855.)

28,151. "Power actuators or servo motors." C. S. Bragg and V. W. Kliesrath. December 22nd, 1923. (226,514.)

28,360. "Control systems for electrically-driven vehicles." W. Gilbert, P. A. H. Mossay, and Ransomes, Sims & Jefferies, Ltd. November 26th, 1924. (245,892.)

28,363. "Electric controllers for hoists." Electro-Mechanical Brake Co., Ltd., and M. J. Pattison. November 26th, 1924. (245,894.)

28,500. "Combined thermionic valve holders and filament rheostats for the construction of wireless apparatus." H. Bailey. November 28th, 1924. (245,895.)

28,655. "Transformers and choking coils, especially for use in radio-communication." Lissen, Ltd., and R. P. Richardson. November 29th, 1924. (245,898.)

28,877. "Device for winding spools, bobbins, coils, or the like with insulated wire." O. Steed and C. J. Robertson. December 2nd, 1924. (245,899.)

30,161. "Electric welding apparatus." W. R. Hume. December 15th, 1924. (245,911.)

30,204. "Device for supporting electric light or like shades." Wilkins and Wright, Ltd., and J. H. Hewitt. December 16th, 1924. (245,913.)

30,390. "Galvanic batteries." Oldham & Son, Ltd., and W. D. Wilde. December 17th, 1924. (245,916.)

30,483. "Control arrangements of the moving parts of wireless telegraph and telephone apparatus." W. H. Powell. December 18th, 1924. (245,919.)

30,493. "Starters for electric motors." Igranic Electric Co., Ltd., and C. F. Tubbs. December 18th, 1924. (245,920.)

30,784. "Means for indicating when an accumulator is charged." L. Barrett. December 22nd, 1924. (245,922.)

30,926. "Head-lights for motor-cars, motor-cycles, and the like." W. M. Gossip and R. G. Gossip. December 24th, 1924. (245,925.)

31,241. "Plugs and sockets for inductance coils and the like." Lissen, Ltd., and R. P. Richardson. December 30th, 1924. (245,926.)

1925.

545. "Bonding or securing arrangements for electric conductors." Callender's Cable & Construction Co., Ltd., and E. Warbrick. January 8th, 1925. (245,931.)

597. "Fuse carriers." E. W. Jackson. January 8th, 1925. (245,932.)

1,057. "Trip or release mechanisms for electric circuit breakers and like apparatus." G. Ellison. January 13th, 1925. (245,936.)

2,429. "Dry cells." Mannesmann-Motoren-Werke. March 24th, 1924. (231,135.)

2,441. "Electrically-driven rotary printing presses and like machines." O. Y. Imray (Bergmann Electricitäts-Werke Akt.-Ges.). January 27th, 1925. (245,947.)

2,459. "Head-lamps for motor road vehicles and the like." H. C. Rushton. January 28th, 1925. (245,948.)

2,816. "Holders for valves, coils, and the like of wireless apparatus." C. H. Rombach and F. Brown. January 31st, 1925. (245,950.)

3,504. "Electric frequency changers." British Thomson-Houston Co., Ltd. February 9th, 1924. (228,938.)

4,250. "Unit for eliminating local disturbances in wireless reception." A. E. R. Trotman. February 16th, 1925. (245,953.)

4,579. "Aerials and lead-in wires for radio-telephony." E. Hales. February 19th, 1925. (245,955.)

5,635. "Projecting apparatus for illuminated signs." A. R. Meissner and H. H. Byrne. March 2nd, 1925. (245,963.)

8,919. "Inductance devices such as transformers or repeating coils for telephone circuits." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). (Western Electric Co., Inc.). April 3rd, 1925. (245,981.)

9,586. "Diaphragms for sound-reproducing instruments." J. W. Phillips. April 9th, 1925. (245,982.)

10,299. "Transformer couplings suitable for radio systems and the like." Marconi's Wireless Telegraph Co., Ltd. April 19th, 1924. (232,640.)

10,400. "Magnetic materials." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). (Western Electric Co., Inc.). April 22nd, 1925. (245,986.)

10,574. "Emergency braking system for electric vehicles." Maschinenfabrik Oerlikon and P. Altorfer. April 22nd, 1925. (Addition to 231,905.) (245,987.)

10,664. "Retainers for electric lamp sockets and the like." F. C. Lee and G. S. Peckham. April 24th, 1924. (245,989.)

11,365. "Alarm fuses." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) and H. J. Gowring. May 1st, 1925. (245,994.)

11,925. "Electrical resistance units such as rheostats and other conducting coils." G. H. Whittingham. July 12th, 1924. (236,898.)

12,225. "Electrical instruments for medical treatment." Y. Noishiki. May 11th, 1925. (245,997.)

13,183. "Apparatus for winding a wire in the form of a figure 8 on two parallel pins." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 21st, 1924. (234,487.)

14,152. "Micrometer movement device for use with variable electrical apparatus." L. E. Fillmore and L. W. Fillmore. May 29th, 1925. (246,009.)

15,314. "Electric commutators or ignition distributors." A. Tauber. June 12th, 1925. (246,018.)

15,401. "Electrodes for electric arc furnaces." International General Electric Co., Ltd. June 14th, 1924. (235,596.)

15,422. "Electric heaters for waving or curling the hair." E. F. Suter. June 13th, 1925. (246,021.)

15,595. "Electric power systems." British Thomson-Houston Co., Ltd. (General Electric Co.). June 16th, 1925. (246,024.)

15,739. "Manufacture of very thin wires." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 18th, 1924. (235,803.)

16,777. "Electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 17th, 1924. (Addition to 235,141.) (242,946.)

17,893. "Electron-discharge apparatus." American Appliance Co. and C. G. Smith. July 13th, 1925. (246,036.)

18,467. "Electrical condensers." Dubilier Condenser Co. (1925), Ltd. July 19th, 1924. (237,285.)

18,591. "Synchronising of alternating electric current systems." International General Electric Co., Ltd. August 6th, 1924. (238,206.)

18,963. "Variable electrical condensers." A. H. Midgley. July 25th, 1925. (246,043.)

22,531. "Electric speed indicators." British Thomson-Houston Co., Ltd. (General Electric Co.). September 9th, 1925. (246,063.)

24,129. "Thermionic amplifying systems." British Thomson-Houston Co., Ltd. September 27th, 1924. (Addition to 238,550.) (240,488.)

25,067. "Electric arc lamps." E. Steinberg. March 24th, 1925. (Divided application on 7,805/25.) (246,073.)

27,296. "Process and machine for the manufacture of incandescent lamps, thermionic valves, and like apparatus." General Electric Co., Ltd. October 31st, 1924. (242,303.)

27,303. "U-tube manometers." British Thomson-Houston Co., Ltd. November 8th, 1924. (242,634.)

28,036. "Electrical conductor or filament." Dubilier Condenser Co. (1925), Ltd. November 7th, 1924. (242,661.)

29,247. "Radiogoniometers." E. Bellini. November 20th, 1924. (243,372.)

Board of Education Examinations.—The Board of Education has issued the time table for the science scholarship examination and the examinations for Whitworth scholarships. The examinations will be held on April 28th to 30th and May 1st to 8th at times between 6 and 10 p.m.